CEREAL SCIENCE *today*

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OF INTEREST THIS MONTH

- HUMAN NUTRITION AND CEREAL SCIENCE
- MICROSCOPICAL ANALYSIS
- FEED INGREDIENT SEPARATION BY FLOTATION
- A.A.C.C. CONVENTION SCENES

OFFICIAL PUBLICATION OF THE AMERICAN ASSOCIATION OF CEREAL CHEMISTS

INSIDE SCIENCE

THE VITAL STORY OF

Breakfast Cereals

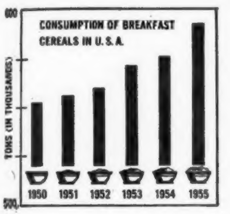
with essential vitamins and minerals restored

by Science Writer

New Edition

AMERICA LIKES BREAKFAST FOODS

Let no one doubt the popularity of breakfast cereals among Americans. The chart below traces the consumption of these fine foods between 1950 and 1955. During that period annual consumption rose by *76,000 tons*. In just one year, 1955, Americans ate 2½ lbs. of hot and 4.8 lbs. of cold cereals per person!



Why are breakfast cereals so well-liked? They are tasty; they are easily served; they appeal to busy homemakers, as well as institutional dietitians, because they are readily available in a variety of flavors at a modest cost. They add interest and value to an important but sometimes neglected meal —breakfast. Their use is extending to between-meal and party snacks, too.

Many grains are processed to make breakfast cereals: wheat, corn, oats, rice. Eaten with fruit and milk or light cream, they contribute an excellent combination of basic, flavorful, nutritious foods to the diet.

Better Foods for Better Health Through Restoration

The science of nutrition has advanced rapidly. In the manufacturing process of some cereals, some of the essential "B" vitamins and minerals are subject to some loss, just as with other foods.

These losses are inescapable when such grains are prepared for human use. When this became known, manufacturers acted to overcome the losses. They adopted restoration.

Restoration simply means that certain important vitamins and minerals are restored to the cereal food during processing, so that the vitamin and mineral values in the finished product are generally equal to the whole grain values of those elements. Wheat, corn and rice products are customarily so treated. Vitamins B_1 (thiamine), B_2 (riboflavin), niacin (another "B" vitamin), and the mineral, iron, are those most widely restored. Vitamins C and D are also sometimes added.

Pre-sweetened cold cereals emphasize the nutritional importance of added vitamins. Increased calories require more "B" vitamins for best utilization of the food.

Why the Vitamins are Important

Physicians and diet experts have proved that vitamins are essential to prevent certain deficiency diseases and to contribute to robust good health.

Vitamin B_1 (thiamine) helps build and maintain physical and mental health. It is essential for normal appetite, intestinal activity, and sound nerves. A lack of this vitamin leads to beriberi, a rarity in the U. S. A., but still a very serious health problem in other parts of the world.

Vitamin B_2 (riboflavin) is essential for growth. It helps to keep body tissues healthy and to maintain proper function of the eyes.

Niacin is needed for healthy body tissues. Its use in the American diet has been largely responsible for the virtual disappearance of pellagra, a serious disease.

Vitamin D helps children develop normal teeth and bones. It prevents the development of certain abnormal bone conditions in adults.

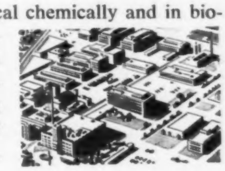
Iron is essential for making good red blood and for the prevention of nutritional anemia.

Where Do the Vitamins Come From?

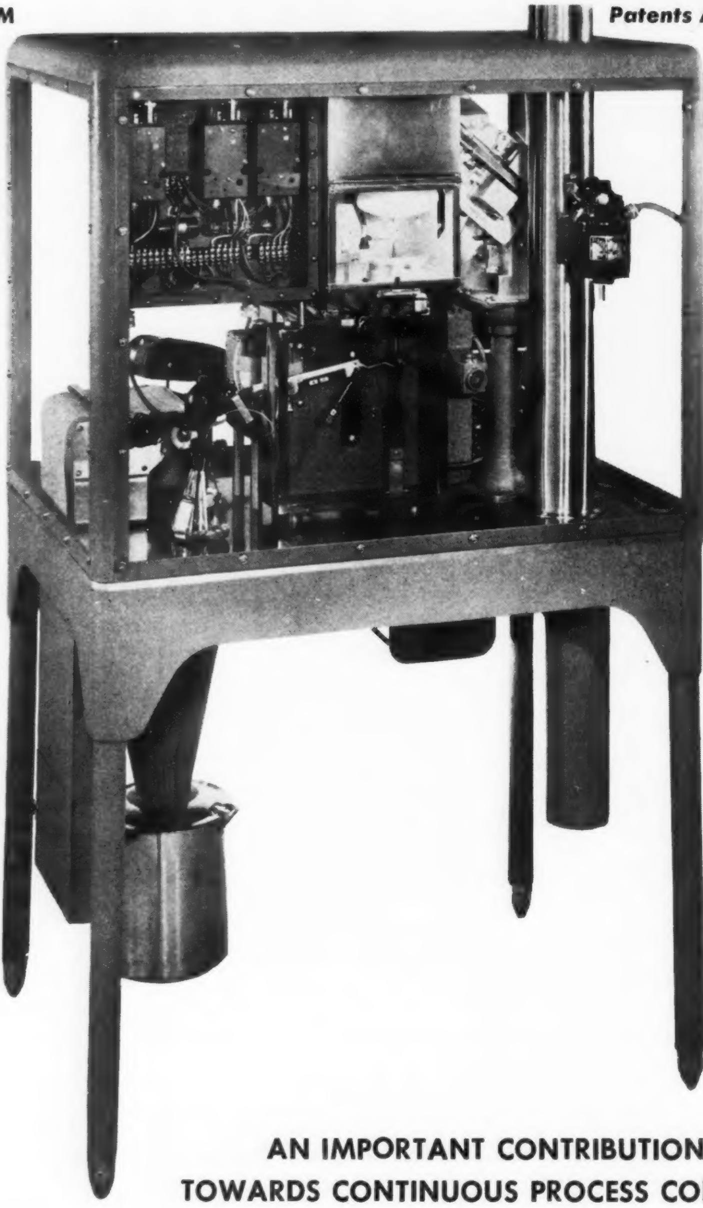
At about the same time that processing losses in breakfast cereals became known, other developments in the scientific world made available ample supplies of vitamins at economical prices. Thus, the nutritional contribution of some breakfast cereals could be, and was, greatly improved through restoration.

Since the early days of breakfast food restoration and of white flour and white bread enrichment, the world-famous firm of Hoffmann-La Roche has supplied top quality vitamins *by the tons*. Pioneering work in its laboratories and by its collaborators resulted in the "duplication" of some of nature's extremely complex substances. First, the chemical composition of the vitamin was learned. Second, the pure substance was isolated. Third, the "duplicate" was made by synthesis. And fourth, the laboratory techniques were extended to large scale commercial operations.

The manufactured "duplicate" is identical chemically and in biological activity with nature's own product. A vitamin is still a vitamin regardless of whether nature or man made it. So efficient is large-scale manufacturing, that vitamins are sold at a lower cost than if they were extracted from natural sources.



This article is one of a series devoted to the story of vitamin enriched or restored cereal products: white flour, white bread and rolls, corn meal and grits, macaroni products, white rice, breakfast cereals, farina. Reprints of this article, of any other in the series, or of all are available without charge. Please send your request to the Vitamin Division, Hoffmann-La Roche Inc., Nutley 10, New Jersey. In Canada, Hoffmann-La Roche Ltd., 286 St. Paul Street, West; Montreal, Quebec.



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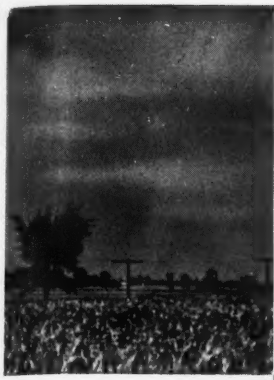

CEREAL SCIENCE *today*

FEATURES

TECHNICAL SECTION

DEPARTMENTS

STAFF

COVER: Dr. William B. Bradley, Technical and Scientific Director of the American Institute of Baking, and newly installed President of the AACC..

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Editorial

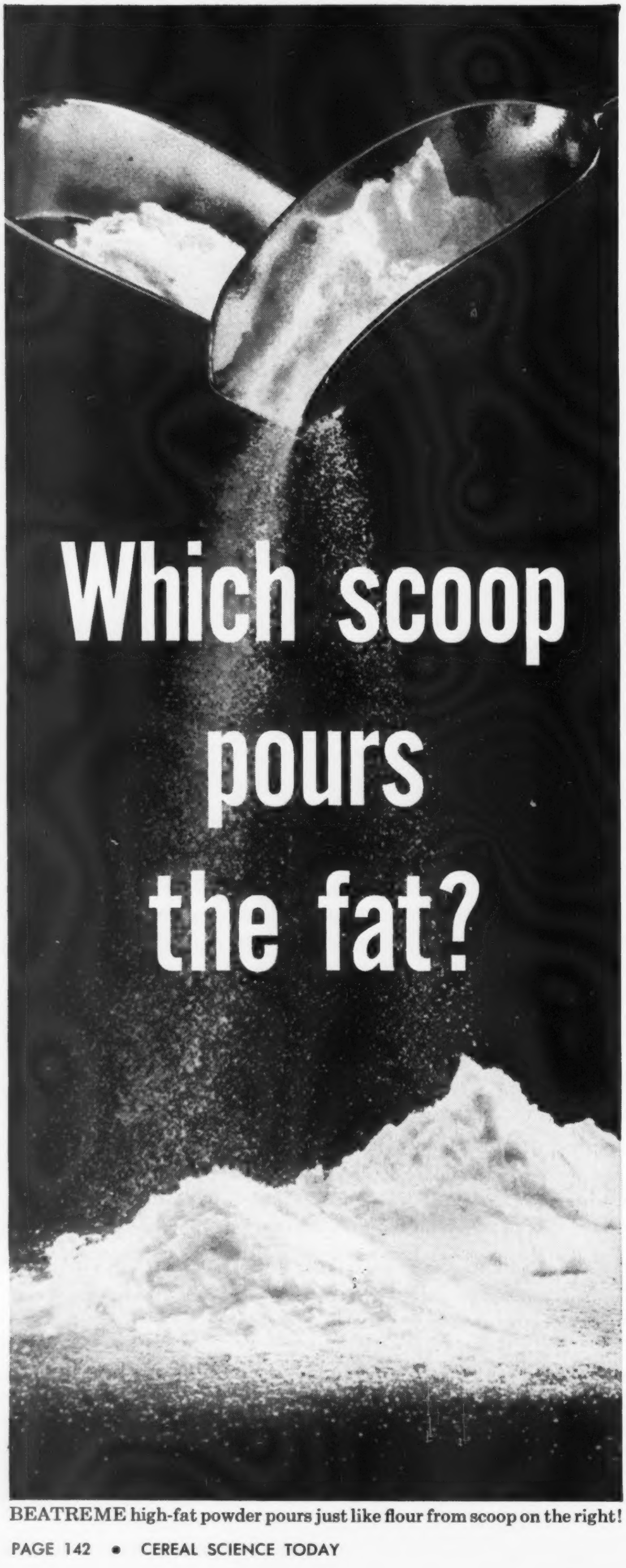
RECENT PUBLIC ANNOUNCEMENT of a new flour milling process has excited much interest. Perhaps of equal or greater significance than the mechanical innovations of the process itself was the prediction that it might bring about a change in accepted concepts of wheat quality and in types of wheat used to produce flours for various end uses. A few days earlier, trade papers disclosed plans of another company to proceed with the commercial development of a continuous breadmaking process that has demonstrated significant economies in test installations. Rapid strides have been made in recent years in livestock feed formulation and manufacture. Bulk handling of flour and other mill products is becoming more and more common.

These are just a few of the things that have happened, are happening or are about to happen in the cereal processing industries. A revolution is taking place. With it come new problems, new challenges, and most important new opportunities for cereal technologists. Knowledge of the materials being processed and imagination to visualize new approaches and new products are more important than ever before. To an increasing degree, company managements may be expected to depend upon their technical staffs for guidance on how to best exploit the developments that progress brings.

CEREAL SCIENCE TODAY is now in its second year of publication. A year's experience and readers' comments reaffirm the soundness of the policy that guided this new journal at its inception. In an era of change the importance of communication between scientific specialists responsible for the conception and implementation of these changes cannot be overestimated. The editors intend to solicit and select material for publication on the basis of its value to a significant portion of the AACC membership.

How well this is done can best be judged by you, the reader. May we urge every one of you to let us have the benefit of your comments?

PAUL E. RAMSTAD



BEATREME high-fat powder pours just like flour from scoop on the right!

AACC PRESIDENT DISCUSSES

Human Nutrition and Cereal Science

By Lawrence Zeleny *

We, as cereal chemists, have certain important basic responsibilities which many of us frequently lose sight of in our preoccupation with more immediate problems. How often do we stop to consider the broad objectives of our profession, or even perhaps to wonder what these objectives are? Certainly our most fundamental aim is through research and the application of scientific knowledge to learn new truths and devise ways in which the people of the world may be better fed. Nearly all of us are working toward that end in one way or another, although we may approach our objective from many widely different angles. Whether we are running routine flour ash determinations or delving into the effect of ionizing radiation on the microflora in stored grain, our basic objective is the same; namely, to provide more and better food for mankind.

Our Worldwide Scope

Although we are the American Association of Cereal Chemists, we must not confine our thinking and our efforts to the problems of one country. We are truly an international organization. Over 12 percent of our more than 1100 members are in countries other than the United States. We are represented in 26 different countries and in all of the continents of the world (except Antarctica). It is therefore important that we look at our science from a truly international viewpoint. Many parts of the world are looking to us for help in solving their food problems. In rendering technical guidance and assistance we are contributing materially to the better international understanding and friendship which are so badly needed in this world of ours.

Cereal products constitute the principal source of food in the world. In some countries from 80 to 90 percent of the caloric intake consists of cereals. Although consumption of cereals in the United States is considerably less than in many other countries, they still contribute more to our diet on a caloric basis than any other class of food. In addition, they supply a very substantial part of our protein, B vitamins, and iron. The rapid and accelerating rate of increase in population throughout the world may still further increase the importance of cereals in the diet, since the available farmland can produce more food in the form of grain than in the form of meat or dairy products.

Malnutrition Is Always with Us

Hunger and malnutrition have been among the worst enemies of man ever since he left the Garden of Eden to live where nature did not supply his needs so abundantly. Even in this "enlightened" age famine and starvation still periodically haunt many corners of the earth, and some of us who have plenty to eat may not in reality be properly fed. Until comparatively recent times it was believed that a person, to be well fed, merely needed a full stomach. Later it was realized that some kind of balance between proteins, carbohydrates, and fats was required. Still later and within the memory of many of us, the need for certain vitamins, minerals, amino acids, and fatty acids in the diet has come to be known. The lack of any one of these essential elements is incompatible with life itself, and even a minor deficiency of any one of them is incompatible with optimum health.

Deficiency diseases have killed or ruined the lives of untold millions of people, even when food supplies appeared to be quantitatively adequate. Beriberi, caused by thiamine deficiency, has perhaps been the worst of these diseases, and is still a serious scourge in many parts of the Orient. The "fortification" of rice with thiamine, niacin, and iron has resulted in a spectacular decrease in beriberi in those parts of the Orient where it is used and the almost complete elimination of the disease in an area of Bataan in the Philippines during an experimental period when all rice consumed was so fortified.

The "enrichment" of flour, bread, and other cereal products in the United States with B vitamins and iron is frequently belittled on the grounds that with our varied diet there is no need for the additional vitamins and minerals. It is quite true that the benefits of enrichment are much more difficult to demonstrate in the United States than in other countries where diets without enrichment are uniformly very deficient. Nevertheless, most nutrition authorities are convinced that the benefits of enrichment in the United States have been very real. Pellagra, due primarily to niacin deficiency, was once quite common in certain areas of the South, but has nearly disappeared since the introduction of enriched bread, corn meal, and grits. Symptoms of B-vitamin deficiencies are disappearing from among the patients of charity clinics while, at the same time, no comparable decrease in

* Chief, Standardization and Testing Branch of the Grain Division, Agricultural Marketing Service, U.S. Department of Agriculture, Washington, D.C. Presented at the 42nd annual meeting of the American Association of Cereal Chemists, San Francisco, California, May 19-23, 1957.

symptoms of vitamin C deficiency has been observed.

There can be no question but that a great many people throughout the country and in all walks of life choose diets that without enrichment would be somewhat deficient in one or more of the nutrients supplied by enriched grain products. It seems very likely that cereal enrichment has contributed much more to the health of the nation during the past 16 years than it has been given credit for or than can be proved statistically.

Have we as cereal chemists, working with our colleagues the human nutritionists, now exhausted the possibilities in pointing the way toward better nutrition through cereal products? This is a difficult question to answer, but it seems quite possible that we have only scratched the surface and that research in human nutrition now under way may open broad new fields for health improvement and an increase in useful life span through diet.

Is Enrichment Adequate?

The refinement of cereal grains through milling results in food products more palatable and digestible than whole-grain products. At the same time, however, the vitamins and minerals are largely removed. In our present enrichment plan thiamine, riboflavin, niacin, and iron are restored to the refined mill products used for food in amounts prescribed by the Food and Drug Administration's Definitions and Standards of Identity for enriched flour, bread, corn meal, corn grits, farina, and macaroni products. The addition of calcium and vitamin D is also permitted. These vitamins and minerals are the ones about which we have the most information in respect to human requirements and that are likely to be deficient in the diet. They are also ones that can readily be incorporated into cereal products.

Whole grains contain other vitamins and many other minerals that are largely removed in milling. Many of these are nutritionally essential. Some of them need not be considered as possible food enrichment ingredients since they are amply supplied by almost any diet. There are other vitamins and minerals, however, about which we need more information in respect to human requirements and possible deficiencies in the diet. Some of these are now being used in proprietary pharmaceutical products and even in a few food products. Vitamin and mineral preparations for direct consumption serve a useful purpose, but, unfortunately, are used least by those persons who need them most. The proper incorporation of these materials into foods such as grain products provides the best and most economical means of getting them to where they will do the most good.

Among the essential nutrients that may find greater use as food supplements are vitamin B_6 (pyridoxine), vitamin B_{12}, copper, and cobalt. Certain essential amino acids, particularly lysine, should also be mentioned. All of these nutrients could readily be incorporated into cereal products, but more should be known about their need and their limitations before greater use is made of them.

"Stop Signs" in Enrichment

Present enrichment requirements as defined in the Food and Drug Administration's Definitions and Standards of Identity are based on sound nutritional principles. Great care must be taken to make sure that the incorporation of any additional ingredients into enriched foods is based on equally sound principles. Any attempt to enrich grain products with additional ingredients solely for the advertising appeal such additives might have would lead to charges of quackery and would tend to discredit the whole enrichment program. We, as cereal chemists, must exert our leadership in discouraging any such exploitation.

No vitamin, mineral, or other nutrient should be added to any food solely for the purpose of nutritional improvement unless convincing evidence is available (1) that it will benefit a certain segment of the population by minimizing or correcting a specific dietary deficiency, and (2) that it will not create any harmful excess of the nutrient in the diet of any segment of the population already receiving an adequate or more than adequate intake of the nutrient through normal dietary channels. Any nutrient not conforming with these two criteria should be sold in drugstores, not food stores.

Whither Life Expectancy?

Life expectancy of the very young has increased amazingly since the beginning of the century, thanks largely to improved sanitation and nutrition and to the conquering of most infectious diseases. In this field the medical profession and its allied sciences have accomplished a feat that 50 years ago would have been considered inconceivable. When we reach middle age, however, our life expectancy now is not much better than was that of our grandparents. The diseases that strike us down, often without warning, in the very prime of life are still for the most part mysteries. However, science is now turning its attention to the subduing of these diseases with all the powerful new tools at its disposal, and who would dare say that it will not succeed? If the same degree of success should be attained as in the conquering of the diseases of infancy and childhood, how long could we then expect to live? Life expectancy, barring accidents, may eventually be extended almost indefinitely, and the Fountain of Youth would then at last be discovered! In spite of the seemingly insurmountable social problems such a development would create, there can be no doubt that even during the lifetime of many of us significant progress will be made toward that goal, be it good or bad. Even now we may be on the very verge of major discoveries that if heeded will appreciably increase the productive years of our lives.

Dietary Fat and Heart Disease

Coronary heart disease is the number-one killer in the United States and in many other parts of the world. Until recently this scourge was considered to be the inevitable consequence of aging, hastened by the tensions and strains of modern living. Preventive measures were limited largely to easing of nervous tension and avoidance of overwork after the age of 40 or 50. Then came the surprising observation that during the latter years of World War II in Germany and other war-torn countries the death rate from coronary heart disease dropped sharply in the face of the fact that the populations were subjected to greater nerve strain and overwork than were perhaps ever experienced in the history of man. At the same time, however, the diet of the civilian population was of necessity greatly restricted, particularly in respect to its fat content, since fats and oils were almost unobtainable. Later investigations have shown statistically highly significant relation-

ships between dietary fat, blood cholesterol levels, atherosclerosis due to cholesterol deposits in the coronary arteries, and death rates from coronary heart disease among different population groups.

All of this proves nothing, but it does point a warning finger of suspicion at excessive dietary fat as a possible important factor in the heart disease problem. Since fat consumption in the United States is the highest of any country in the world (about 40 percent of the total caloric intake) and the death rate from coronary heart disease is likewise the highest in the world, we should be particularly interested in the outcome of current research in this field.

Although all fats have been under suspicion, it now appears that there may be great differences in the behavior of different kinds of fat in the diet. The more saturated fats appear to increase blood cholesterol levels, while the relatively unsaturated fats may act quite differently and in some instances have been shown to reduce blood cholesterol levels. There is some evidence that cereal fats, and particularly corn oil, may be unusually effective in reducing blood cholesterol, more so than other unsaturated vegetable fats of similar chemical composition.

Perhaps some substance in corn oil other than glycerides is responsible for this surprising effect. The apparent superiority of corn oil in this respect, however, needs further confirmation before it can be fully accepted.

Although much remains to be learned concerning the effect of dietary fats on the chain of events that leads to heart disease, the grain and allied industries, and we as cereal chemists, will do well to follow closely all developments in this fascinating and highly important field of research. If some of the current indications are confirmed by further research, the impact on the cereal industry may be very great indeed.

Some nutritionists are already advising a substantial reduction in fat intake for all persons of middle age and beyond. Even though such advice may be premature, it can probably be given without fear of harm since in some countries low-fat diets are the rule and do not appear to have any undesirable effect. Some fat is necessary, of course, to supply the nutritionally essential fatty acids and to

(Please turn to page 169)

THE NEW AND IMPORTANT ROLE OF

Microscopical Analysis In Product Control

By Kenton L. Harris and O'Dean L. Kurtz*

THE ORIGINAL IMPETUS for work in microscopical analysis was the Federal Food, Drug, and Cosmetics Act and similar legislation concerned with the adulteration of food.

A food is adulterated, according to the definition assigned by this legislation, if it consists in whole or in part of any filthy, putrid, or decomposed substance; or if it has been prepared, packed, or held under unsanitary conditions whereby it may have become contaminated with filth.

Enforcement of these requirements by regulatory agencies and voluntary programs for sanitation improvement launched by food industry groups have brought about widespread and profound improvement in the sanitary quality of foods and in the conditions under which foods are manufactured. Microanalytical techniques for the detection of extraneous materials in foods have contributed substantially to this progress.

Early and Recent Work

Early work began with *whole* insects in such products as blueberries, cherries, and tomatoes. It was soon recognized that similar infestations in raw materials to be processed into comminuted food products — tomato catsup, flours and meals, fig paste, and the like — would result in contamination with *pieces* of whole insects. Thus there has developed in the last 25 or 30 years a body of methods designed to extract from food products insect filth to be studied under the microscope.

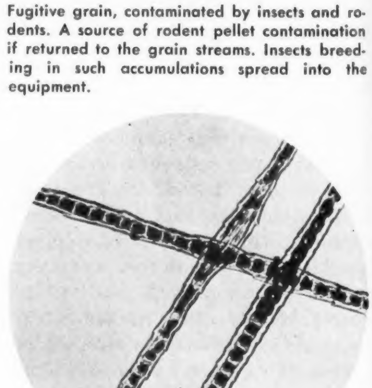
Prior to 1950, much of the emphasis was on counting particles of insect origin, with little attention given to identifying the insect. A laboratory manual compiled by the Food and Drug Administration for use by FDA analysts gave instructions for reporting and classifying specific types of insects and insect fragments that were of major significance as filth, but it was not until 1950 (1) that a systematic study of insect fragments began to bring this type of analysis to its full scope. Shortly after this date the results of two surveys were published (2, 3), clearly indicating that certain types of insect fragments in flours and meals could be traced back to insects in the raw materials.

Soon several papers (4, 5, 7, 8, 9) made it clear that fragments of various insect species could be differentiated. This was the first real step in the use of insect-fragment identification to determine the etiology of the contamination. Government regulatory agencies now were in a better position to determine where to place responsibility for the contamination. At the same time, industrial control laboratories had at their disposal a new analytical tool to assist in sanitation control. Sanitarians have long recognized that on-the-spot inspection is the most direct and effective means of control; yet constant sanitation analyses on finished products also are needed, to make doubly certain that plant conditions do not contribute filth.

Identification Criteria

Although whole insects can be identified by standard techniques, insect material recovered from finely ground or powdered products is usually so fragmented that taxonomic characters provided in the entomological literature are useless. Identifying insect fragments by these newer criteria, therefore, as distinct from merely recognizing insect fragments as such, calls for extensive knowledge of the characteristics of fragments. Moreover, these criteria must be tied to fragments that survive the processing operations common to the particular industry or product; that can be extracted from the food by commonly used laboratory techniques; and that

Fugitive grain, contaminated by insects and rodents. A source of rodent pellet contamination if returned to the grain streams. Insects breeding in such accumulations spread into the equipment.



Rodent hairs from cereal food. Such hairs are an index of the presence of rodent pellets.

*U.S. Food and Drug Administration, Department of Health, Education, and Welfare, Washington, D.C.

can be recognized as insect debris and so subjected to the closer scrutiny sometimes required for identification.

Miscellaneous insect fragments from flour.

Frontal area, larva of granary or rice weevil. This area is characteristically different from the same area of other cereal-infesting insects. Compare the next photograph.

This last aspect has been discussed recently in a paper (6) on identification of larval insect fragments in cereal products. Where insects are subjected to grinding or other processing methods that involve comminution, the body wall breaks into fragments of all sizes and shapes, some of which are discrete portions of recognizable anatomical areas, and also into so-called undifferentiated fragments of insect cuticle. In sanitation analysis these fragments, while apparently of insect origin, may lack diagnostic characters by which they can be identified specifically. Examination of many food products has shown that of the insect larval body, portions of the head contribute the fragments which are most likely to have discrete identifiable structures.

Significance to the Cereal Analyst

Thus there is emerging a branch of entomological taxonomy that is related simultaneously to food technology, to insect micromorphology, and to sanitation analysis. It is of special significance to the cereal analyst that much of the trail-blazing in this work has been done with insect pests of cereal grains, mills and elevators, baked-goods and alimentary-paste manufacturing plants, and stored cereal products and, hence, parallels the increased emphasis being placed on sanitation control.

Sanitation and sanitation analysis are becoming an inseparable part of quality control, and the field of the cereal chemist is being enlarged to encompass a broader analytical domain of chemical, physical, and biological analysis. At the same time, the regulatory analytical procedures of the Association of Official Agricultural Chemists are providing quality-control tools for commercial cereal chemists, who are obligated to their companies and to the public alike, to continue to maintain the integrity of our food supply.

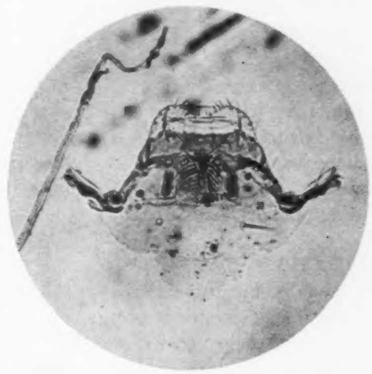
Sanitation Programs

Microscopical analyses may be applied to raw materials, to intermediate products, and to the finished product. The use of sound raw materials not only helps maintain the cleanliness of the finished product, but also helps to prevent the carrying of live insects into a plant where they can multiply and compound the in-plant sanitation problem. Whether the situation involves Drosophila flies arriving on succulent fruits or vegetables and building up to objectionable proportions on the receiving dock or within the plant, or whether it is some other live insect on incoming wheat, that may spread through and infest an entire mill, an adequate sanitation-laboratory control program can be of value in revealing such conditions before they get out of hand.

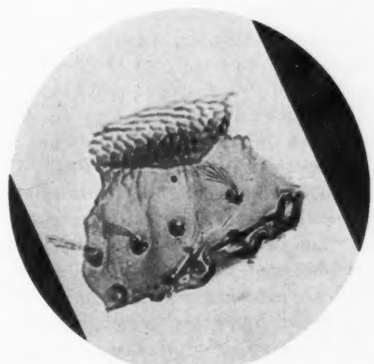
Similarly, examination of the finished product can be an integral part of the sanitation program. Here it must be recognized that counting of insect fragments should include a complete laboratory determination, so as to permit full evaluation by management. Recent court proceedings under the Food, Drug, and Cosmetics Act have clearly demonstrated that size and type of insect fragments can be used in pinpointing unsanitary conditions that have allowed insect debris to contaminate a product moving interstate. Information on the condition of finished baked goods, determined by a bakery laboratory, can be a warning signal; management then knows that insanitary conditions exist, and can clean them up before they become a matter for legal action. The advantages of taking adequate precautions against seizure or prosecution are quite apparent. A recent week-long seminar held by industry, state, and federal analysts dealing with corn meal attests to some of the activity in this regard, and to the practicability of working out characteristics useful for identifying insect fragments.

General Scope of the Work

The accompanying photographs illustrate some of the work being done,



Frontal area, larva of sawtoothed grain beetle. This area also is characteristic of this species. Compare the previous photograph.



Skin fragment from rice or granary weevil. Note surface pattern, seta bases, and characteristic plume-shaped setae.

covering the entire food production industry. With the dependence of the ultimate consumer on the food manufacturer for his "daily bread," and the interdependence of the various manufacturers for raw materials and other ingredients, we have long ago passed the stage where we can trust to luck for quality control. The con-

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AIMS OF THE PLANT SCIENTIST IN

Breeding Wheat for Quality

By L. P. Reitz*

WHEAT BREEDERS STRIVE to satisfy the needs of both the farmer and the miller by developing productive varieties having high quality. Quality means somewhat different things to these two groups. In addition to a high yield of grain from his acres, the farmer's income is affected by such pricing factors as weight per bushel, protein content, soundness, and purity of the grain.

The Farmer's Viewpoint

Usually the farmer's income from wheat is determined mainly by the volume that he grows and the test weight of the grain that is marketed. It is an exception when other factors make detectable differences to him. In his defense, therefore, it should be said that the farmer is usually justified in choosing the variety that produces the most and has the heaviest test weight. When other quality factors are sufficiently important to justify discount or premium prices, he is willing to change varieties. Proof of the latter statement was shown last year when, in one year's time, acreage of undesirable varieties was cut in half because Commodity Stabilization Service announced a discount of 20 cents per bushel on such wheats in the Government's price-support program.

The Miller's Viewpoint

Millers are concerned primarily with a high yield of flour at low cost which enables them to meet the price and the rigid specifications of flour buyers. Consequently, millers will go to whatever market is necessary to buy the wheat they need if it is economical to do so. Sometimes this requires direct purchase from the producer, or, at other times, a long haul from a distant market. Selection and blending of wheat to give a product that is uniform and endowed with the good performance needed to meet buyers' specifications is a highly developed art.

At this point, quality takes on a very different aspect compared with quality factors that are apparent and important to the farmer. Millability, the nature of protein contained in the flour, chemical composition of the endosperm, enzymes, pH, mixing time, mixing tolerance, and a long list of other quality differences come into prominence. Furthermore, what is good quality in flour for one use is not good for other uses. And most perplexing of all are the opposite views expressed by bakers about a flour intended for the *same* use.

This leads to a situation in which both praise and condemnation may be expressed when a breeder asks representatives of the trade for appraisal of flour from a new variety of wheat. To whom will the breeder listen, and by whom will he be guided? Obviously he cannot breed opposing characteristics into a variety; for example, a variety cannot at one and the same time have long mixing and short mixing requirements. Experience suggests that breeders should aim for a safety plateau of quality which would be a level generally suited to a wide range of uses for that class of wheat, or a level readily modified by simple chemical or other means to fit bakers' specifications. Breeders know that "fairly good" varieties, when too abundant, become a drug on the market because their use is limited by the extent to which they can be modified or blended.

What is Quality in Wheat?

Breeders have tried to define quality in terms that have some biological basis. They have found, as you have, that quality is an elusive term.

Quality refers to the way a product is constituted, its distinctive traits or excellence of character, and the possession of peculiarities of the sort that make anything such as it is. Quality in wheat and flour is the characteristic or combination of characteristics determining the degree of acceptability, usefulness, and value to the user. Thus we see that high quality exists or can exist only as an attribute that prevails after a certain level has been reached, as protein content, for example, and in a certain complex fitted to receive it, as for the making of light bread. Recognition of quality depends upon the adequacy of tests we use to measure the degree to which known desired characteristics are present in the wheat or wheat product. Those who test the breeder's wheats for quality are concerned mainly with determining whether grain from a variety *qualifies* for a particular use, that is, whether it is endowed with the required degree of ability to be fit for such use.

This is not of much value to a breeder. He needs to know the intrinsic worth of the varieties he breeds and needs the information in terms of distinct, measurable attributes, not merely that one variety is "good" and another is "bad." He needs these evaluations separated from the modifying effects of the environment, interpretable over a range of environmental conditions.

In its four quality laboratories, one for each major wheat-producing area, the U.S. Department of Agriculture is making adjustments in the inter-

* Agronomist, Crops Research Division, Agricultural Research Service, U. S. Department of Agriculture, Beltsville, Maryland.

pretation of quality when protein levels and the other factors vary among several varieties being evaluated. Plant breeders find this approach extremely helpful.

Dilemmas of the Breeder

Breeders have been confused and dismayed over several situations in wheat quality. One is general ignorance on the part of breeders and cereal technologists about basic quality differences and failure to express known differences precisely. Progress has been made and is being made, but there is much yet to be learned about the starch, protein, minerals, enzymes, etc. in the wheat kernel as they affect physical characteristics, so important in quality. Should breeders be serious about such superficial requirements and such imaginary indications of freshness as softness in a loaf of bread, or the ability of a cake to stand rough handling in transit? Do these constitute quality characteristics of a basic nature?

This leads to a question about the flavor and nutritive value of the bread we eat and the wheats we breed. Some quality requirements seem contrary to good nutritional standards. I am unable to understand why minerals in flour are undesirable. Yet low ash is mandatory on most flour orders because of certain implications. Likewise, it appears undesirable to have high protein in many baked products even though diets may be deficient in protein. Several vitamins are added to flour, and this is laudable, but we do not know the full complement of what the wheat kernel contains. Yellow color is a major objective in macaroni quality, but there must be characters far more important than this. It is a mystery to me why the consumer wants yellow macaroni and white bread.

Dough development curves have some utility for determining water absorption and for planning dough mixing schedules, and reflect in general the mixing time and mixing tolerance. I look forward to the day when mixing time and several other quality factors will be within the baker's control to a large extent, thereby relieving the plant breeder of some responsibility for these quality factors. It seems futile to try to breed wheats with precisely the right mixing time, color, etc., to meet every need and hazard. The needs of the trade vary from year to year and from shop to shop, varieties tend toward concentrated production in certain areas, and seasons alter the quality level of the varieties that may be grown. Breeders and farmers cannot alter the commercial acreage year by year, changing back and forth from one variety to another whenever weather factors bring about marked shifts in the average quality of a year's crop. Such changes require a sequence of years to accomplish. Breeders can serve the trade best by developing varieties with "built-in" safety margins of quality — levels of excellence that will be extreme in some years, far beyond what bakers can utilize except by blending or chemically modifying the flour. Wheat varieties of this type could be mellowed to bring them into the optimum utility level — the assumption here being that it is usually feasible to reduce quality but not to raise it.

Opportunities and Aims

Several new opportunities in breeding for quality have special significance in this connection.

Protein content can be changed by breeding.

Varieties equal in yield to old varieties but with 2 to 3% more protein are now widely grown in Southeastern states of the U.S. For example, in a 3-year test involving six to eight stations in Southeastern states each year, the average yields of Hardired and Atlas 66 were 27.4 and 28.2 bu. per acre. Corresponding proteins were 10.10 and 13.30%, respectively. Whether increased protein in soft wheat is desirable or economical will depend upon the use to which the wheat is put, the extent to which excess protein can be neutralized, and whether premiums are paid for higher protein. Active breeding work is under way in Nebraska, Oklahoma, Utah, and Washington to determine the extent of protein modification that can be brought about by systematic breeding. In the spring wheat region it is generally recognized that Lee is higher in protein content than most other varieties and that Henry and Red Bobs are lower.

Protein quality in varieties is not affected equally by weather, especially high temperatures.

What appears to be a new opportunity to breeders is the development of varieties more stable under extreme weather conditions. Loaf volume and mixing time may be reduced 50% by high temperatures (above 90° F.) accompanied by low humidity during the last 15 days of kernel development. Varieties having long mixing time are more tolerant than those with a short time, but notable differences are showing up among varieties with similar mixing times. Another apparently related finding is the superior loaf volume given by wheat grown on well-watered soil *versus* that grown under extremely droughty conditions. It remains to be seen whether some varieties are more tolerant to extreme soil drought.

High test weight is compatible with high breadmaking quality.

For years, efforts failed to combine high test weight and strong gluten in hard winter wheats. The Blackhull group of varieties have high test weight but consistently have mellow-to-weak gluten. Wichita and Cimarron were partial steps. Now Texas has developed (via Cimarron) wheats with very high test weight, stronger gluten, and excellent breadmaking quality. Other states have made similar progress.

Increased milling value.

Research has shown that the usual flour yield of 72-75% can be increased to 80% without sacrifice of flour quality, provided the best attributes of known varieties are combined.

Durum color is a matter of pigments and enzymes.

Pigments concerned with the yellow color of macaroni products from durum wheat are modified by lipoxidase. Hence, it is important to breed for low enzyme content if persistence of yellow color is desired.

Protein levels can be modified upward at will to bring experimental materials into a protein range where bread quality can be more readily measured.

It is almost impossible to evaluate bread wheats in a protein range below 11%. A single spraying of the plants in the field with urea at the rate of 50 lb. nitrogen per acre about the time of heading has increased protein content from 10.8% to 15.2% in trials in Kansas. The increased protein behaved normally in baking trials. Other forms of nitrogen have

been applied to the plants in this manner. This technique permits a study of various specific nitrogen groups as utilized by the plants in forming the gluten protein complex. Nitrogen fertilizer applied to the soil late in the season also may increase protein content.

Fungal enzymes give greater precision in control of dough and bread.

Among other enzymes, protease from fungal preparations has been shown to have profound effects on dough and bread characteristics. A nonelastic or bucky dough is made soft and pliable by controlled additions of protease. Amylase retards staling and does not result in sticky or gummy crumb characteristics. These and other effects give the baker greater control of certain quality characteristics, provided the potential for modification is in the flour in the first place. Many quality factors can be changed in only one direction, downward; hence, a "safety zone" wheat becomes of greater value in such a situation.

Poor bolting properties of Rex found related to pentosans and thick endosperm cell walls.

Measurements show that pentosans from the thick cell walls of the endosperm contribute to the objectionable milling quality. Work in California and Oregon indicates that this aspect of milling quality may be predicted by differences in the amount of pentosans that can be extracted with an acid. Breeding for low levels may be done readily if this work succeeds.

Cookie quality is largely a flour hydration phenomenon and is markedly affected by the starch tailing fraction.

Reconstitution studies reveal that this fraction (mostly pentosans from endosperm cell walls) is responsible for much of the differences varieties express in cookie spread, although particle size appears important also. Therefore, a simple test of acid-extractable pentosans may give breeders greater opportunities to breed good-quality wheats for cookie flour.

Bran cleanup now tested on grain from a single plant.

A micromill gives results on 5 g. of wheat, enabling breeders to eliminate questionable varieties early in their development. With one mill, tests can be run on 600 samples a day.

Misconceptions about quality requirements and the value of certain tests are being corrected.

Some new concepts are shocking, but plant breeders need to know what is true and what is imaginary. The following statements are distinctly contrary to what was believed only a few years ago.

a) Every use does not require a narrow range of quality characteristics, but a rather wide range may be suitable. *(Cereal Chem. 23: 388–399. 1946.)*
b) Ash, protein, and viscosity limits commonly specified for cookie flour have little or no relationship to cookie diameter. Their value, if any, is for uniformity to suit a particular recipe or for certain machine operations.
c) Mixing time has little relationship to bread loaf volume potentialities.
d) Thick bran does not necessarily account for poor milling quality.
e) Hard red winter and hard red spring wheat classes, when compared on an equal protein basis, have equal intrinsic breadmaking quality.
f) A good soft wheat may produce excellent bread if it is in a suitable protein range.

Increased precision in accounting for quality differences is in prospect, and these will be introduced into flour specifications and into breeders' objectives.

Quality Safety Zones

What do we mean by quality "safety zones"? Simply levels of excellence well beyond the critical breaking point within the acceptable quality range. This would call for varietal quality that would be considered "extreme" by some mill or bakery control chemists. Extremes would be tolerated only for those characteristics readily modified. A list follows showing the trait and modification possible by known methods for bread wheats:

Mixing time: Breed for long times, shorten by blending or by use of protease in the dough. No practical way is known to extend the time, but removing water-soluble materials or mixing in nitrogen gas show promise in Nebraska tests.

Yellow color: Breed for light yellow, make lighter by bleaching.

Protein content: Breed for high percentage, reduce by blending or leave it high for better nutrition. Some denaturization technique may be useful on flour that is too strong.

Kernel hardness: Breed for very hard nonweathering kernels, soften by higher temper, as required.

Weight per bushel: Breed for heavy weight that will remain high after weathering of the grain.

Flour yield: Breed for high yield of flour and price wheat on this basis, not on test weight.

Mixing tolerance: Breed for tolerance — separate from mixing time, if possible.

Protein quality:

a) Loaf volume — breed for high volume, use bread test. Doubtful if too much volume potentiality is possible.
b) Texture—breed for small, thin-walled cells.

Several familiar varieties will serve as illustrations. Marquis, Thatcher, Turkey, and Comanche are bread wheats possessing excellent quality characteristics. Used alone when at flour proteins above about 12.5%, they are difficult to utilize in a bakery but are excellent in blends with weaker wheats. These would be termed "safety" wheats and would constitute desirable goals for breeders. Even more extreme types conceivably would be useful. Varieties such as Mida, Henry, Pawnee, and Yogo might be considered acceptable under certain conditions. They are excellent in many cases but generally are not suitable for blending with weaker wheats and often need bolstering in one way or another to make them fully satisfactory. Varieties such as Spinkcota and Chiefkan seldom are satisfactory unless at higher-than-normal protein levels, and may not be acceptable even then. The latter kinds should never be approved for release.

The Cereal Scientist's Part

Similarly we should consider the pastry wheats and set safety levels for milling characteristics, viscosity, absorption, curve types, cookie factor, protein content, color, cake quality, etc., and indicate the extent to which each can be modified readily by known treatments. Very likely some goals for this class would be just the opposite of those enumerated for bread wheats. Breeders could then breed wheats which the cereal chemist could use directly or readily modify to meet his precise needs. For example, no breeder is concerned about pH

of the flour, and should not be. Control chemists know how to adjust the pH to suit the baker's need. A flour may be equally suited to cookies and layer cake, but the bleaching treatment (pH adjustment) of the two flours will differ according to their intended uses.

Breeders need the help of cereal chemists in setting long-time goals for quality based on levels that provide the safety features discussed here. Such safety zones should be set up by breeders and chemists working together, so that features attainable by breeding could be agreed upon and those features attainable by chemical modification eliminated from plant-breeding objectives.

Opportunities for breeders and cereal chemists to meet on common ground are provided in many ways, especially through the collaborative testing of new varieties and the activities of advisory committees. These, while useful, should be expanded and directed toward future problems and needs.

Cereal chemists are in an increasingly good position to help in this undertaking as their understanding of components of quality increases. Basic research on these problems is needed and should be supported by the wheat industry. Breeders will be increasingly effective as they succeed in translating trade needs into biological factors and in building these requirements into varieties possessing safety margins.

Sanitation:

(Continued from page 147)

sumer has a right to expect that sanitation control has been exercised in the production of the food which he purchases, and the manufacturer certainly has a stake, both in the raw materials coming into his plant and in the well-being of the consumer.

Laboratory control is an essential part of food production, and only when such control is exercised can the plant be said to be functioning under good, modern commercial practice. Even in the absence of information that a plant is overtly violating a statute, the fact that it is operating without laboratory control may be sufficient to cause its products to be suspect.

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NEXT MONTH

Dr. Hugh K. Parker of Wallace & Tiernan explains the "Baker Do-Maker" process for the cereal chemist. D. B. Pratt, Jr. of Pillsbury discusses chemical and baking changes which occur in bulk flour during short term storage.

People, Products, Patter

. . . People

E. J. Bass, Grain Research Laboratory, Winnipeg, attended the annual convention of the ASBC in New York, May 5-9.

Buell W. Beadle has been appointed manager of the chemistry division of Midwest Research Institute, Kansas City, Mo. He succeeds **John T. Goodwin, Jr.,** now technical director of Corn Industries Research Foundation.

M. S. Buckley joins Getz Exterminators, Atlanta, as technical director and division manager; has been associated for the past 15 years with pest control, particularly food plant and industrial sanitation.

W. Bushuk, Grain Research Laboratory, Winnipeg, has been awarded the (Canadian) National Research Council Postdoctorate Overseas Fellowship tenable in the Centre de Recherches sur les Macromolecules, Strasbourg, France, as well as the Rutherford Memorial Fellowship. Dr. Bushuk and family will leave for Strasbourg in September.

Irving D. Canton named assistant manager of international research department at Armour Research Foundation.

William L. Clark, professor emeritus of department of biological chemistry at John Hopkins school of medicine, named to receive Passano Foundation Award of $5000 for 1957, on June 5 in New York City. The award will honor Clark for his "long and distinguished career as investigator and teacher, and for demonstration . . . in the control of pH and of oxidation reduction to the study of life processes."

John D. Commerford now senior research chemist at Anheuser-Busch (from Callery Chemical).

George R. Cowgill, professor of nutrition at Yale University and editor-in-chief of the Journal of Nutrition, will receive the Osborn and Mendel award for 1957, administered by the American Institute of Nutrition. The award consists of $1000 and a scroll. Cowgill will be recognized for "his many pioneer and subsequent fundamental research contributions to our knowledge of the B-vitamins and of protein nutrition; and for his numerous other broad contributions to the science of nutrition as a teacher, as editor of the Journal of Nutrition, and as an expert adviser in this field."

Thomas A. Downey named representative to industrial section for technical service department of Chas. Pfizer & Co.

Norris D. Embree named director of technical operations, Distillation Products Industries. **Robert L. Edwards** named general sales manager; **Kendrick S. French,** sales manager of oils department, and **David S. Tappan,** purchasing agent.

F. G. Ferrick named assistant product manager specializing in sales of unsaturated fatty acids for Armour & Co. chemical division. **D. W. Malec** succeeds him as representative in New York and New Jersey.

Sam D. Fine promoted from chief chemist in Denver district for Food and Drug Administration to chief of Kansas City district. Succeeded by **Donald M. Taylor.**

Edward G. Fochtman named supervisor of chemical engineering research at Armour Research Foundation.

Edward P. Gillin retires as technical manager of the corn products division of Anheuser-Busch, Inc., to become a technical consultant in the field of starches and starch derivatives, their manufacture and industrial application.

Clell B. Hartley named research lab manager for Fairmont Foods Co., Omaha.

Katharine J. Hivon appointed chemist with Human Nutrition Research Division, Agricultural Research Service, USDA, Beltsville, Md.

Herbert Charles Gore died at St. Petersburg, Florida, on April 2 at age 79.

Mr. Gore worked for some years in the U. S. Department of Agriculture, first as scientific assistant (1902-1912), then chemist, Department of Fruit and Vegetable Utilization. He joined the Bureau of Chemistry in 1912 while Dr. Harvey Wiley was chief of the bureau. In 1924 he went to Fleischmann Laboratories as research chemist, retiring in 1942.

Mr. Gore made significant contributions to enzyme technology, starch technology, and the chemistry of coffee and of soluble coffee. He was the inventor of the maltose sugar process, based on his discovery of a method of crystallizing maltose from a concentrated solution of maltose obtained by enzyme conversion of starch. He published numerous papers on the determination of sugar by the polarimetric method, technology of fruits and vegetables, cereal technology, and measurement of diastatic activity. He was a member of the A.C.S. and A.A.C.C.

Eugene E. Howe appointed director of nutrition for Merck Institute for Therapeutic Research.

G. N. Irvine, Grain Research Laboratory, Winnipeg, and **A. W. Alcock,** Maple Leaf Purity Flour Mills Co., Ltd., Winnipeg, left April 2 on a mission to Japan under the auspices of the Canadian Wheat Board and Board of Grain Commissioners for Canada. Dr. Irvine continued his trip in a westerly direction through Karachi, Rome, Paris, Amsterdam, and the United Kingdom before returning to Winnipeg June 9.

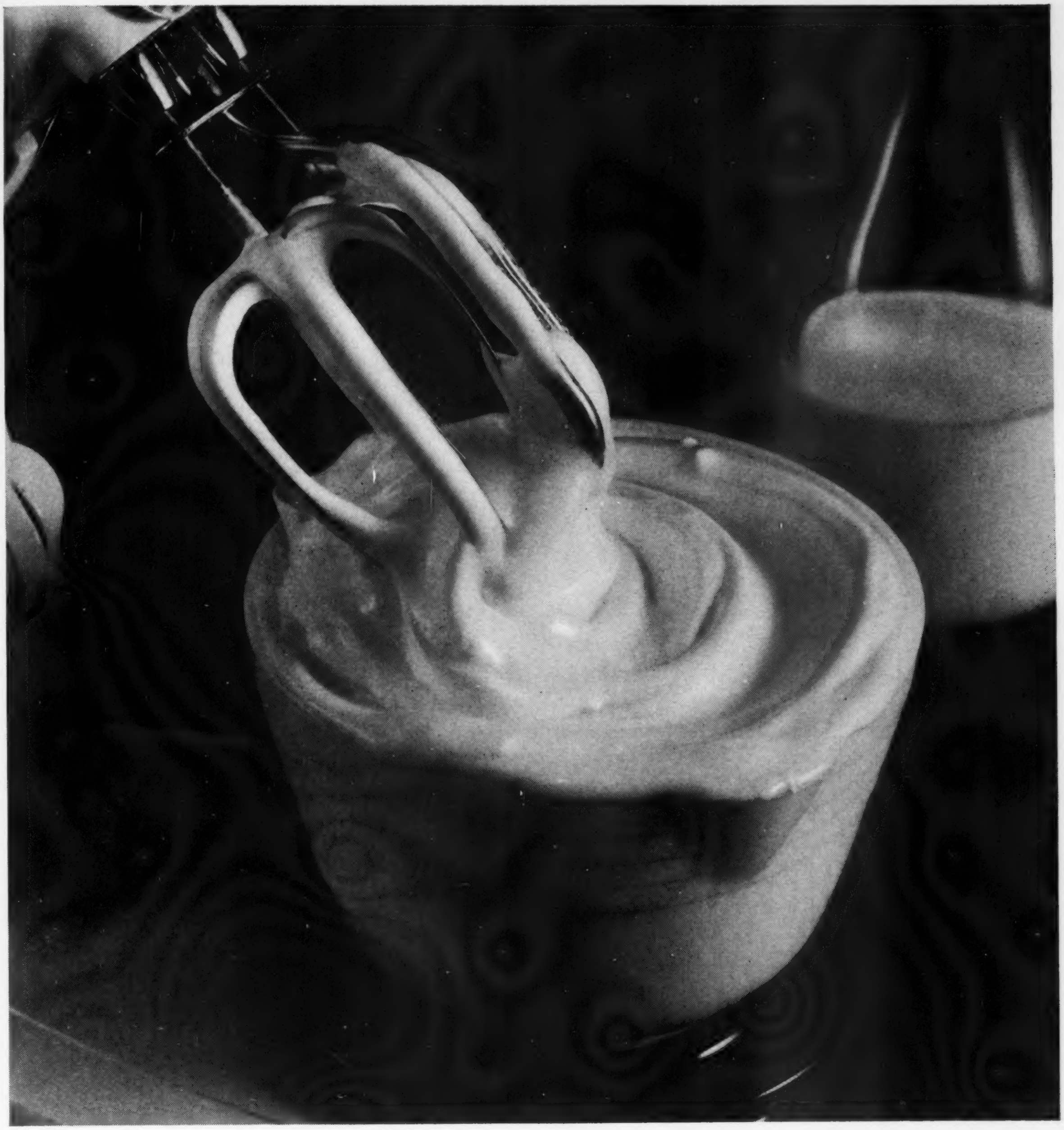
John A. King named director of research for Armour & Co.

E. O. Korpi named manager of manufacturing and product development of food products division at Procter & Gamble. **J. H. Sanders** appointed associate director in charge of process development in the division.

William A. Leitner joins staff of overseas development division of Procter & Gamble.

C. R. McAlister from Procter & Gamble promoted to plant superintendent for W. T. Young Foods, Inc., Lexington, Ky.

(Please turn to page 167)



A.A.C.C.

The final meeting of the Board of Director... are present at this final meeting. From l... John A. Johnson, Lawrence Zeleny, Jam... Jr. Not present is Isydore Hlynka, newly...

Top left, scene from the President's Reception. Almost 300 members attended this first official gathering held on Sunday evening.

Close up of the reception line. Front to back, Lawrence Zeleny, Mrs. Zeleny, William B. Bradley, Mrs. Bradley, Clinton L. Brooke, and Mrs. Brooke.

Facing camera, left to right, Harry Alleman, Mrs. Schwain, Frank Schwain, William Cathcart, and Mrs. Cathcart enjoying the Sunday buffet.

New Officers of the AACC. Left to right, James Pence, Secretary; Clinton Brooke, President-Elect; Lawrence Zeleny, retiring president; William Bradley, President; D. B. Pratt, Jr., Treasurer.

.[M]eets in San Francisco

. . . First West Coast meeting in the history of the Association deemed a success. Over 560 persons enjoyed a well planned technical program and the charm of one of the country's most unusual cities . . .

Directo[rs] at noon on Thursday, May 23. Both incoming and outgoing members of the Board [f]rom l[ef]t: Wendell Reeder, Mark A. Barmore, William L. Rainey, William H. Cathcart, , Jam[es] ...nce, William B. Bradley, Majel M. MacMasters, Clinton L. Brooke, and D. B. Pratt, newly... from Canada.

WITHOUT A DOUBT anyone back from San Francisco will agree that the cereal industry on the West Coast is showing excellent growth. The attendance at the AACC's 42nd Annual Meeting demonstrated quite clearly the growth in membership west of the Rockies. Perhaps a return trip can be made in less than the 42 years it took to make this first visit.

The technical program consisting of 58 papers was well augmented with four excellent guest speakers talking on a broad range of subjects of vital interest to the cereal chemist. The address by Lawrence Zeleny, AACC president, entitled "Human Nutrition and Cereal Science" set the tone for the entire meeting. The majority of these papers will be published in one of the AACC's two publications, Cereal Chemistry or Cereal Science Today, during the next several months.

The next few pages will provide a brief glance at some of the meeting activities and members attending.

Lawrence Zeleny (at the right), retiring President of the AACC congratulating incoming President William B. Bradley at the meeting's close.

A scene from Sunday registration at the Sheraton-Palace Hotel. Over 400 technical personnel attended this first West Coast event.

William H. Cathcart (center), past president, receives the President's Recognition Scroll from Lawrence Zeleny, President. The award was made at the AACC's banquet on Wednesday evening. Mrs. Zeleny is seated to the right.

Top left: J. Ansel Anderson shows Mrs. Anderson the Thomas Osborne Medal. The award was made during the AACC's banquet.

Scenes from the banquet. The Hawaiian theme was carried out with individual leis, cocoanut palms at strategic locations, and background music from the islands. Dancing followed the dinner.

Hilo Hattie, star attraction of the Hawaiian show, gives hula instructions to AACC members. Left to right: S. F. Brockington, John Whinery, F. C. Buzzelle, Mark A. Barmore, Glen Findley, and Jim Doty. These gentlemen displayed remarkable talent as evidenced by the enthusiasm of the audience.

Three old friends renew acquaintances. Left to right: Bill Schroeder, The Humko Co., Robert Pickenpack, General Mills, and George Trum, Russell-Miller Milling Co.

Robert A. Larson, Pillsbury Mills, and Harry Obermeyer, General Mills, talk over problems of the Northwest Section at National and Local Section Officers meeting held on Wednesday.

Top right: Ludvig Reimers, George R. Swindaman, and Oswald A. Oudal, all of General Mills, confer on company business. In the background is Peter Goldberg, MIAG Northamerica, describing equipment displayed by C. W. Barbender Instruments, Inc.

Donald Meek, John Koski, and Emery Swanson, Pillsbury Mills, discuss a paper just presented in the technical session.

Arthur Hartkopf, president of the Barbender Corporation, Charles Sullivan, Wm. Kelley Milling Co., D. O. Hiebert, Buhler Milling Co., and V. Roberts, Kansas City Laboratory Supply, look over some new laboratory instruments on display.

Bus boarding time for the ladies. AACC wives prepare for a trip across the Golden Gate Bridge and to Muir Woods.

Left, Claude D. Neill, Board of Trade Laboratory, Enid, Okla., discusses a topic of mutual interest with a fellow AACC member.

CEREAL SCIENCE today

Technical Section

EFFECTS OF IRISH MOSS EXTRACTIVE (CARRAGEENAN) ON WHEAT-FLOUR PRODUCTS[1]

ELMER F. GLABE, PAULINE F. GOLDMAN, AND PERRY W. ANDERSON, Food Technology Inc., Chicago, Illinois

THE REACTION OF Irish moss extractive, or carrageenan, with wheat-flour proteins was first reported by Sullivan, who examined it in the course of a general study (6) on the reaction of anionic substances with flour proteins and found a demonstrable effect of this reaction on farinograph curves. She also found that cationic and nonionic detergent compounds had little influence on physical measurements made on flour-water doughs. However, anionic detergents showed a toughening of the gluten, as evidenced by farinograph tests.

Chondrus crispus, a red seaweed, also known as Irish moss and carrageen, is found in the cooler portions of the Atlantic Ocean. The extractives, commonly known as Irish moss extractives or as carrageenan, contain anionic compounds. Essentially they are mixed salts of a polysaccharide sulfate. Galactose units account for approximately two-thirds of the total organic matter. The remaining matter appears to be six carbon sugars but is of undetermined structure. Carrageenan is prepared by extracting seaweed with water, drying on hot rolls, and grinding to a powder. The carrageenan is readily dispersible in water to form sols of varying physical and chemical properties, depending upon the treatment rendered during preparation of the extractive. Stoloff (5) has reviewed the chemistry of carrageenan or Irish moss extractive.

Irish moss extractives of various physical and chemical properties show evidences of reaction with both plant and animal proteins. Smith (4) shows the reaction of extractives with milk protein. Useful in the manufacture of chocolate milk, the milk protein-carrageenan reaction permits suspension of the heavier cocoa particles uniformly throughout the liquid, thereby preventing separation.

It is know also that gels formed from carrageenan and starch have greater strength than those made from either substance alone, indicating the possibility of an interaction between the two. The role of carrageenan is a polysaccharide in combination with other flour components may be as significant as its reaction with protein. Although this report is concerned with the starch and protein reactions, other authors have expressed their views on other possible reactions. Baker *et al.* (2) have discussed the characteristics of soluble pentosans and heavy polysaccharides in relation to dough properties. Udy (7) found that about 95% of the intrinsic viscosity of the water extract of wheat flour is due to the polysaccharides present, the remainder being contributed by the soluble proteins. A discussion of the effect of pentosans on the performance of doughs can be found in the report of Pence *et al.* (3).

The effects of Irish moss extractive, also an anionic compound, on dough, bread, and alimentary paste products are described in the present report.

Gluten-Washing Experiments

Several experiments were performed employing the standard gluten-washing test as described in *Cereal Laboratory Methods* (1). The Irish moss extractive was dry-mixed with flour and this combination was then treated in the method described. Observations were all based upon the character of the wet gluten rather than of the dried material. An arbitrary numerical scale of gluten strength was used, as indicated by degree of toughness. A gluten ball was made from a standard flour with each run. This gluten ball was assigned a value of 8, the other balls being judged accordingly. A looser and more flaccid ball was given a lower number, a tough or firmer ball a higher number. Observations were made by feeling the gluten in the fingers after it had been allowed to stand in water at room temperature overnight.

Table I shows some comparisons of gluten balls washed from various kinds of flour previously mixed with 0.1% of three different Irish moss extractives.[2] It will be noted

TABLE I

COMPARISON OF EFFECT OF 0.1% OF VARIOUS IRISH MOSS EXTRACTIVES ON GLUTEN OF DIFFERENT FLOURS

Kind of Flour	Gluten Strength Value[a,b] "Seakem 9"	"Seakem 14"	"Seakem 21"	No Extractive
Southwestern winter wheat baker's (normal)	12	....	....	9
Southwestern winter wheat (baker's (weak)	11	....	....	6
Northwestern spring wheat baker's	14	8	15	10
Winter wheat family	12	7	13	7

[a] The values obtained were arbitrarily assigned by comparison with a standard flour, given the value 8.
[b] Extractive "Seakem" Type 9, viscosity 100-125° MacMichael, nongelling; Type 15, viscosity 100-125° MacM., gel strength 80-110 g.; Type 21, viscosity 100-300° MacM., nongelling.

[1] Manuscript received August 13, 1956. Presented at the 41st annual meeting, New York, May 1956.

[2] "Seakem" types 9, 14, and 21, discussed in footnote, Table I.

that some of the extractives showed considerable effect on the gluten of all of the types of flour tested. At least one extractive, however, showed very little effect on two kinds of flour.

The gluten balls prepared as indicated in Table I were put through an experimental bread-molding machine with its rollers set quite close together. The gluten balls containing Irish moss extractive showed a very marked property of springing back to a nearly spherical shape after having been flattened. The untreated flour-gluten balls did so very slowly.

Table I also shows a comparison of gluten balls made from a Southwestern winter wheat flour of normal baking characteristics and a flour from another Southwestern winter wheat described as having weak baking properties. In this case the Irish moss extractive showed considerably more toughening action on the "weak" flour than on the normal flour.

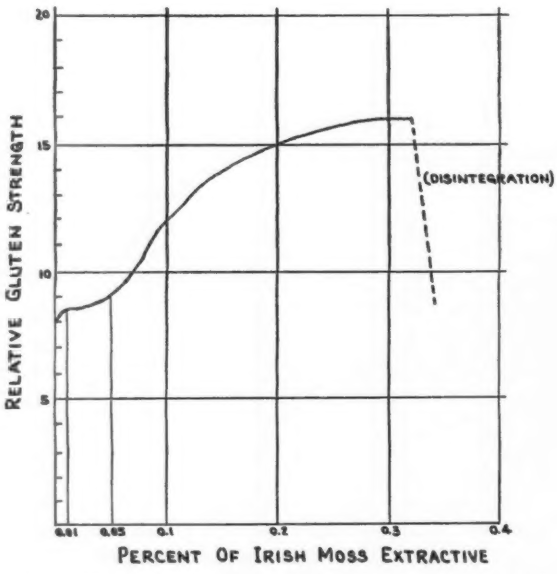


Fig. 1. Effect of Irish moss extractive on wheat gluten (Kansas winter wheat baker's flour). Gluten strength values were arbitrarily assigned as in Table I.

Figure 1 shows the effect of increasing quantities of one Irish moss extractive on the resiliency of gluten balls washed from a standard Kansas winter wheat baker's flour: an increasing toughening action up to the level of 0.3% carrageenan. Beyond this amount disintegration of the gluten ball is too great to evaluate toughness of the gluten. At 0.10% the reaction resulting in gluten toughening was definitely observable; below the level of 0.05% very little practical difference was noted. The extractive in this series of tests produced no significant effect on the pH of the flour.

Farinograph Tests

Farinograph curves were made using flours of various types preblended with Irish moss extractive. Where extractive was added it was first pre-blended with the flour. Control curves determine the absorption increase necessary to reach the 500 point on the chart as the maximum.

The curves made with Kansas flours containing 0.2% of "Seakem" type 14 Irish moss extractive arrived at the peak as much as 2½ minutes sooner than the control. The time of holding at the peak was increased as much as 2 minutes. At 0.1% level the effect was less, but still observable (Fig. 2).

The curves made with Texas flour or soft-wheat flours were influenced little by 0.2% of extractive.

In general, the time of holding at the peak is but slightly increased and the rate of descent from the peak is diminished.

The effect of the extractive is much more noticeable on the farinograph curves of the hard wheats and, more specifically, the higher-protein hard wheats than on the curves from the flours with lower protein and the weaker flours. Figure 2 shows a typical comparison of two farinograph curves made on a Northwestern spring wheat flour of 13.65% protein. These curves also show that the higher-protein flours appear to be able to carry a larger amount of extractive. Note in this figure the tendency for the curve with the flour containing the extractive to come to the peak more quickly than that of the control, and to remain at this peak for a longer time.

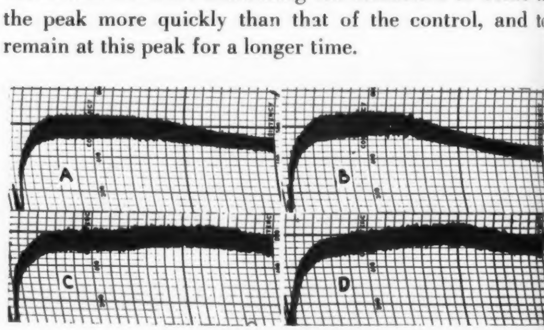


Fig. 2. Effect of Irish moss extractive on farinograph measurement of a Kansas winter wheat flour and a Northwest spring wheat flour: A, Kansas winter wheat flour; 0.1% "Seakem" 14 extractive; absorption 60.5%. B, Kansas winter wheat control; absorption 60.0%. C, Northwest spring wheat flour; 0.25% "Seakem" 14 Irish moss extractive; absorption 68.3%. D, control; absorption 67.7%.

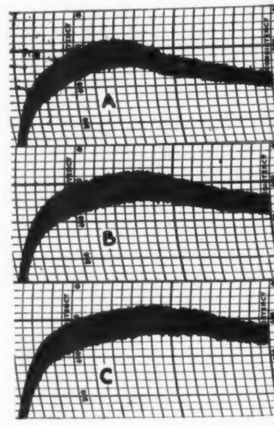


Fig. 3. Effect of Irish moss extractive on farinograph measurement of durum semolina-farina blends: A, control; 25% durum semolina, 75% farina; absorption 54.5%. B, 0.2% "Seakem" 14 Irish moss extractive suspended in water; absorption 55%.

Durum semolina and durum-farina also give farinograph curves which demonstrate the protein-carrageenan reaction. The effectiveness or degree of the reaction is markedly increased if the carrageenan is suspended in water, rather than being dry-mixed with

flour. Figure 3 shows these differences. These curves were made on a blend of 25% durum semolina and 75% farina. Adding the extractive directly to the flour in dry state increased holding time from 4 minutes on the control to 6¾ minutes. Suspending the extractive in the dough water increased it to 8 minutes. An even greater contrast was shown by using slow-speed mixing on the farinograph.

Measurements on the Brookfield-Stoloff Stress-Strain Gage

Commercial spaghetti was prepared by mixing 0.05 to 0.30% Irish moss extractive with blends of 75% farina and 25% semolina. The extractive was added either as a dry blend or as a suspension in water. It was noted that power requirements on the spaghetti press increased in all tests except when carrageenan was mixed with the flour at the 0.05% level. This was still true even though the amount of water used in preparing the dough was increased.

Spaghetti samples containing 0.2 to 0.3% Irish moss extractive showed less tendency to break down during cooking than the control sample. Spaghetti strands cooked for 20 minutes were subjected to the Brookfield instrument test for breaking strength. The instrument (Fig. 4)

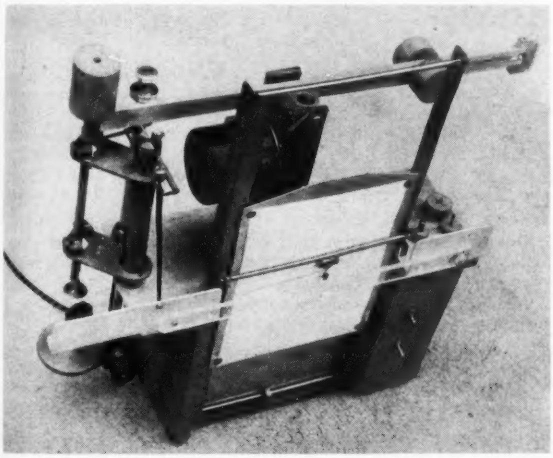


Fig. 4. Brookfield stress-strain gage used to measure breaking strength of spaghetti containing Irish moss extractive.

used for these experiments is a stress-strain gage consisting of a point or surface driven by a force which varies from 1 g. through 1,000 g. It is applied until the material being tested breaks or shears. If the force is removed at a point substantially below the breaking point, the instrument will also record the elasticity of the substance being tested. It records both factors on a chart. Figure 5 shows the type of chart made on this instrument.

Adding Irish moss extractive to spaghetti increases its breaking point, as indicated in the table below. These results are in agreement with taste panel tests in which judges recorded texture differences by mouth feel. Further demonstration that carrageenan provides resistance to breakdown during cooking of the spaghetti was obtained

Effect of Irish moss extractive on cooking strength of spaghetti

	Breaking strength g.
Control	412
"Seakem" Type 14 Irish moss extractive, 0.2%	522
"Seakem" Type 14 Irish moss extractive, 0.3%	557

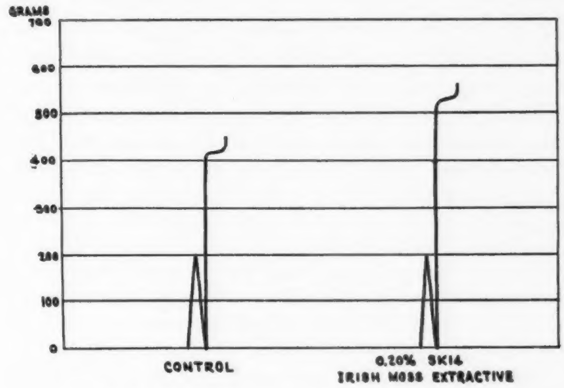


Fig. 5. Type of chart made on the instrument shown in Fig. 4.

by subjecting a canned product to high temperatures for sterilization. The same increase in breaking strength was observed.

The results obtained in increasing the tensile strength of spaghetti with Irish moss extractive, as measured by the Brookfield instrument, show the same tendency as that found with flour-water doughs and extractive as measured by the extensograph.

Bread-Baking Experiments

Extensive laboratory baking tests and several full-scale commercial baking experiments were made in an attempt to correlate the foregoing physical data with baking data and with bread characteristics. Laboratory baking tests indicated an increase in mixing time for most flours. This was interpreted as being more an increased mixing tolerance than a requirement for longer mixing time.

The above observations were made when the carrageenan was added dry with the flour at the dough stage. When the extractive was added to the sponge, an increase was noted in the shortness of the sponge after 5 hours of fermentation. The bread baked therefrom was of good character.

Commercial-size doughs were used for several series of experiments in which the observations could be more easily made owing to the size of the doughs. In one series, doughs made with 1,000 lb. of flour and 5 hours of fermentation were used. The flour was a blend of two-thirds Nebraska wheat short-patent flour and one-third Kansas winter wheat short-patent flour. These flours had been preblended at the mill and were used in both the sponge and dough stages. Increments of 0.1 and 0.2% extractive were placed on top of the flour at the dough stage. After a preliminary study the 0.1% level was found to be best and this amount was employed in the remaining experiments of the series.

The effects noted were an increase in mixing tolerance of the dough, coincidental with the slightly increased absorption. Difficulty had previously been encountered with this flour in obtaining sufficient mixing time to give proper dough development. Some difficulty also had been noted with the doughs at the makeup machinery. The mixing time on the doughs made with 0.10% extractive was increased from 7 minutes to 8 minutes in total time, on a dough of 850 lb. flour at 64.8% absorption.

The effect of extractive in the dough was noticeable at the rounder and molder, where fewer doughs were rejected because of tearing and sticking. Directly after these doughs were placed in the oven it was noted that oven-spring was much more regular and uniform than in loaves made from doughs without extractive. The tendency for this flour to produce irregularly shaped loaves had been a serious difficulty. The flour had not responded to attempts to increase mixing time, to increased or decreased amounts of "yeast food" oxidizing agents, or to use of fungal enzymes. The interior of the loaf structure differed very little from the control.

Doughs made with more than 0.1% of the Irish moss extractive did not show any further increase in mixing time. Correspondingly, those doughs made with less than 0.1% showed virtually no effect on either mixing time or loaf structure, indicating a possible maximum increment level for this flour at 0.15% extractive. These observations are largely typical of other and similar commercial bread-baking studies.

Another series of commercial baking experiments was made on Italian type bread. The flour used was a Northwestern spring wheat flour of 13.65% protein. The baking experience with this flour indicated a need for more dough development at the mixer. When 0.25% of Irish moss extractive was added, an increase in absorption of 0.5% was noted. The dough began its development period in the mixer earlier. The extension of mixing tolerance was also evident. Whereas this flour without the addition of the Irish moss extractive gave loaves of extremely low volume, the presence of the extractive gave a loaf volume of very obvious increase over the control. The Northwestern spring wheat flour farinograph charts shown in Fig. 2 were made with this particular flour; therefore the correlation between the evaluation by the farinograph with actual practice is quite evident.

Summary

Irish moss extractives, which react with proteins of milk, also produce effects on wheat flour. The extractive has possible application as a flour conditioner in bread baking, where it performs a useful function not always possible with oxidizing agents. It increases mixing tolerance and improves oven-spring and texture. In alimentary paste products it improves resistance to breakdown during cooking, as indicated by the higher breaking point recorded by a stress-strain gage.

Acknowledgment

The authors are indebted to the Seaplant Corporation, New Bedford, Mass., for the various samples of Irish moss extractives used, and to Dr. Betty Sullivan for her important assistance and guidance in this work.

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A SUMMARY OF THE QUALITY AND PROTEIN CONTENT OF WESTERN WHEAT VARIETIES[1]

MARK A. BARMORE, Chemist, Agricultural Research Service, U. S. Department of Agriculture, Western Wheat Quality Laboratory, Pullman, Washington

TO OBTAIN STANDARDS for appraisal of the quality of new strains of wheat, many samples of pure varieties now in commercial production were examined. The data obtained reveal the effects of protein content on the quality components of Western varieties. Several relationships previously reported were substantiated, others were contradicted. These relationships make concise descriptions of wheat variety characteristics possible. Western plant breeders and the milling industry find this system useful.

The highly significant and linear relation, especially

[1] Manuscript received August 24, 1956. Contribution from the Western Wheat Quality Laboratory, Department of Agricultural Chemistry, Washington Agricultural Experiment Station, State College of Washington; and the Crops Research Division, Agricultural Research Service, U. S. Department of Agriculture.

within varieties, of protein to loaf volume, absorption, and viscosity has been described by Larmour, Working, and Ofelt (13), Finney (5), Finney and Barmore (8), Salmon, Mathews, and Leukel (16), Miller and Johnson (14), and Bresson and Barmore (3). The mixogram area of groups of soft-wheat varieties was found to be related to protein content by Morris, Bode, and Heizer (15) and by Lamb (12). Nonsignificant correlations were found between protein content and absorption, cookie diameter, and alkaline water retention capacity (A.W.R.C.) of soft-wheat flours by Yamazaki (19). Sedimentation has been reported by Zeleny (20), valorimeter reading by Johnson, Shellenberger, and Swanson (10) and by Miller and Johnson (14), and mixing time by Swanson (17), to be related to protein content for groups of samples made up of several varieties. However, the data were not treated statistically. Johnson and Swanson (11) reported a nonsignificant correlation between protein content and mixing time for a group of eight varieties.

The following data characterize the common western varieties in terms of milling score, certain quality components, and protein content.

Methods

The methods used to determine the components were essentially as follows:

Protein: Kjeldahl method (1).

Milling score: the combination of flour yield, rate of milling, milling moisture, and percent of ash and long patent (2).

Viscosity: Degrees MacMichael of the acidulated flour-water suspension (1, 3).

Absorption: amount of water absorbed by the flour without its becoming sticky during mixing to optimum conditions (5).

Alkaline water retention capacity: the percent water absorbed from a 0.1 N solution of sodium bicarbonate and retained after centrifuging (18).

Mixing curve area: the area under the mixograph curve obtained at optimum absorption (4, 17).

Cookie diameter: a micro modification of the tentative A.A.C.C. cookie method (9).

Sedimentation: the volume of flour settling out of a lactic acid suspension (20).

Valorimeter reading: the readings of farinograph curves from the Brabender valorimeter chart.

Mixing time: the optimum mixing time observed on mixing the ingredients for the straight-dough baking method (7).

Loaf volume: the volume of 100-g. pup loaves baked by the rich, optimum bromate, optimum mixing time, straight-dough method (6).

The samples were of known varieties grown in experimental plots, many of them fertilized with varying amounts of nitrogen, milled on the Buhler experimental mill, and tested in the laboratory.

Statistical Computations

The data were assembled on punch cards and sorted; statistical calculations were made by this institution's computing laboratory. Without this service such a study would be impractical, since more than 250 associations were computed for lots of 10 to 80 samples each. Computations consisted of the correlation and regression coefficients for the above ten quality components with flour protein content for each variety of which ten or more samples had been tested.

The results of the computations are summarized in Table I. This table shows that the viscosity, cookie diameter, mixing curve area, absorption, loaf volume, sedimentation, and mixing time for most of the varieties were significantly correlated with protein content. It also shows that alkaline water retention capacity (A.W.R.C.), milling score, and valorimeter reading were not significantly correlated with flour protein in most of the varieties examined. These effects of protein content are in agreement with those in the literature, except for absorption, cookie diameter of soft wheats, and valorimeter reading. Valorimeter readings were found to be related to protein content in only about one-third of the varieties studied. This does not agree with the reports in the literature. Probably the limited range in protein content in this study is the reason. The cookie diameters and absorptions in this work were related to protein content in more than 70% of the varieties studied. A large proportion of them were soft wheats.

TABLE I

SUMMARY OF STATISTICAL COMPUTATIONS OF QUALITY COMPONENTS VS. PROTEIN CONTENT

Quality Component		No. of Varieties [a]	Number Significant [b]	Correction Applied [c]
A.W.R.C. [d]	Pastry flour characteristics	20	4	....
Viscosity	Pastry flour characteristics	30	30	[d]
Cookie diameter	Pastry flour characteristics	25	20	−0.100 cm.
Mix curve area	Pastry flour characteristics	28	23	3.7 sq. cm.
Absorption	Bread flour characteristics	37	27	0.86%
Milling score	Bread flour characteristics	23	9	....
Loaf volume	Bread flour characteristics	28	28	47 ml.
Sedimentation	Bread flour characteristics	20	20	[d]
Mixing time	Bread flour characteristics	28	16	−0.25 min.
Valorimeter reading	Bread flour characteristics	19	7	....

[a] Number of varieties of which ten or more samples were tested for the component concerned.

[b] Number of varieties for which significant correlations were found between protein content and the component concerned.

[c] Correction applied per percent protein to new or unfamiliar selections.

[d] Correction variable and dependent on level of viscosity or sedimentation at the protein content of the sample.

Variety Ratings

The next step was to apply the variety regression equations and then calculate the viscosity, cookie diameter, mixing curve area, and absorption (the pastry flour components) at 8% protein. Since A.W.R.C. and milling score were significantly related to flour protein in only

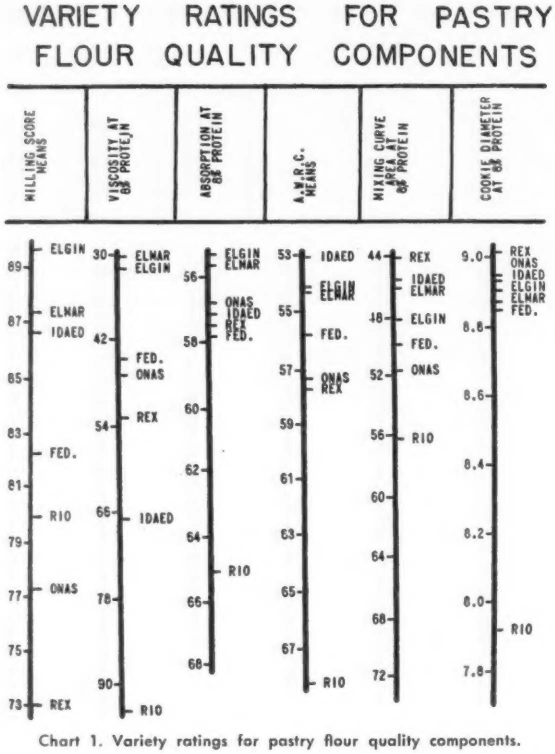

Chart 1. Variety ratings for pastry flour quality components.

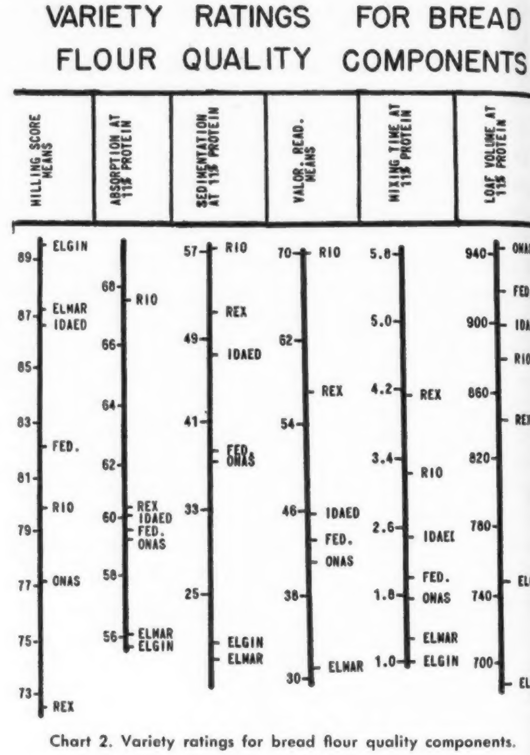

Chart 2. Variety ratings for bread flour quality components.

a few varieties, as shown in Table I, only mean values of these components were calculated. The varieties were arranged according to the corrected and mean pastry flour components in decreasing order of suitability on uniform scales and side by side, as illustrated in Chart 1. Thus, the varieties are arranged in decreasing order of milling score and cookie diameter and increasing order of viscosity, absorption, A.W.R.C., and mixing curve area. This chart constitutes a concise summary of the quality characteristics of these varieties. Differences due to protein content have been eliminated insofar as possible. Chart 1 shows onal a few of the 37 varieties studied.

Chart 2 tabulates bread flour components, after adjustment of those with significant correlations (absorption, sedimentation, mixing time, and loaf volume) to 11% protein. Since valorimeter reading did not appear related to protein content in more than a few varieties, mean values only were used. The rating scale of mean milling scores was repeated in this chart exactly as in the pastry flour rating chart. An absorption rating scale was also included, but the values were calculated to an 11% protein basis. They were arranged in decreasing order because high absorption types are more desirable for bread flours than are low absorption types. Since high sedimentation, mixing time, loaf volume, and valorimeter readings indicate "strength," the varieties were arranged in decreasing order on these scales also.

Use of the Charts

To compare the quality data of new and unfamiliar varieties with those of the established, well-known varieties on these charts, it is necessary to correct the data to 8 or 11% protein content. The effect of protein content on the quality components, except viscosity and sedimentation, was fairly constant for the different varieties as shown by the regression coefficients. Therefore, average correction factors seemed most suitable for new and unfamiliar varieties. Viscosity and sedimentation correction factors varied with level and protein content, as described for viscosity by Bresson and Barmore (3). Loaf volume correction factors for hard wheats were shown to vary with their level and protein content by Finney and Barmore (8). This did not appear to be the case for the Western wheats. There was a fanning out of the regression lines for the relation of loaf volume to protein content, but the limited range in protein content probably explains why the regression coefficient of loaf volume and protein content did not appear to be significantly related to the loaf volume in these samples.

These two charts (1 and 2) have been given limited distribution and are helping the milling industry of the western region to choose the most suitable varieties for production of flour with specific properties. The charts also help plant breeders, milling chemists, and crop improvement officials to describe new hybrids and selections. The properties of the new wheats can be compared to familiar varieties easily by spotting the values of their quality components on the rating scales. This method of describing varieties is a necessary step in developing new wheats to meet specifications desired by the milling and baking industry.

The charts are not considered final, but they are soundly based, concise, and accurate summaries of a large volume of data.

Summary

Quality data for the common Western wheats and many new selections have been recorded on punch cards and subjected to automatic machine computation for statistical information. Correlation coefficients, regression equations, and regression coefficients have been calculated for the various quality components for each variety or new selection. From 57 to 100% of the thirty-seven varieties studied showed a significant relation between protein content and each of the following: viscosity, cookie diameter, sedimentation volume, mixing curve area, absorption, loaf volume, and mixing time. Only 20 to 40% of the varieties showed a significant relation between protein content and alkaline water retention capacity (A.W.R.C.), milling score, or valorimeter reading. The effect of protein content on most of the components changed with different varieties over a relatively narrow range. However, flour viscosity and sedimentation volume changed with protein content for different varieties in a systematic manner, depending on the strength of the flour.

After correction of the quality data of each component for protein content by means of the regression coefficients, the varieties were arranged in decreasing order of desirability. The two resulting charts give concise, reliable summaries of the quality characteristics of the common commercial varieties and the more advanced new selections.

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SEPARATION OF FEED INGREDIENTS BY SELECTIVE FLOTATION[1]

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LOW-POWER MAGNIFICATION, which is usually all that is necessary to identify major ingredients of most feed samples, is almost useless in breaking down a milk replacer. By using high power and various stains and spot tests, most of the ingredients can be identified, but even then any sort of quantitative estimation is difficult.

For this reason, a physical method which would separate the ingredients, perhaps quantitatively, was sought. Specific gravity flotation, using solvents, successfully separates such ingredients as soybean meal and ground yellow corn. If the difference between the common milk replacer ingredients were great enough, separation should be possible.

Six solutions of increasingly lighter specific gravity were made up as follows:

Solution No.	*Skellysolve "B"* %	*Carbon tetrachloride* %
1	0	100
2	10	90
3	20	80
4	30	70
5	40	60
6	50	50

The common milk replacer ingredients were then tested to determine their behavior in the various solutions. In

[1] Manuscript received October 10, 1956.

TABLE I

COMPARISON OF THEORETICAL FRACTIONS AND SEPARATIONS

INGREDIENTS	FRACTION NO.	FORMULA 1		FORMULA 2		FORMULA 3		FORMULA 4		FORMULA 5	
		calculated	*found*	*calculated*	*found*	*calculated*	*found*	*calculated*	*found*	*calculated*	*found*
Minerals	1	2.5	2.1	2.0	2.6	3.0	2.6	3.0	3.4	2.5	2.1
Corn sugar	2	33.0	31.7	5.0	10.5	2.0	8.2	0.0	6.5	15.0	13.4
Oat flour, wheat flour, dried whey	3	0.0 11.5 10.0 } 21.5	21.9	0.0 10.0 10.0 } 20.0	22.0	20.0 0.0 5.0 } 25.0	22.0	10.0 10.0 20.0 } 40.0	28.0	0.0 21.5 10.0 } 31.5	29.2
Soybean flour, dried skimmilk	4 & 5	0 40.0 } 40.0	16.3 26.2 } 42.5	8.0 65.0 } 73.0	28.2 32.0 } 60.2	35.0 35.0 } 70.0	30.0 30.0 } 60.0	17.0 40.0 } 47.0	30.0 24.6 } 54.6	18.0 30.0 } 48.0	19.0 34.4 } 53.4

solution 5, results were confined to skimmilk, which settles; in solution 6, no results. Other results are shown below:

Ingredient	*Solution No.* 1	2	3	4
Minerals	settles	....	....	....
Wheat flour	floats	floats	settles	....
Oat flour	floats	floats	settles	....
Dried skimmilk	floats	floats	floats	half floats, half settles
Corn sugar	floats	settles	....	....
Soybean flour	floats	floats	suspends	settles
Dried whey	floats	floats	settles	....

From this work, it was evident that although complete separation of individual ingredients was not possible, enough difference existed to permit some separation.

Known-formula milk replacers were made up and separated by the following method:

> Weigh 10 g. of sample into a 180-ml. electrolytic beaker (Fisher Scientific Company No. 2-555). Add about 150–160 ml. solution 1 and mix. After 5 minutes, decant the floating material and most of the liquid onto a Whatman No. 4 18.5-cm. filter paper supported in a 100-mm. funnel. Wash the settled material into a Petri dish for drying. Let the filtered material dry and then transfer into another 180-ml. electrolytic beaker. Add solution 2, mix and let stand 5 minutes. Decant as before and wash settled material into a Petri dish. Follow this procedure until the entire sample has been fractioned and dried. Weigh back the fractions.

The various fractions were then examined and found to be composed principally of the expected ingredients. Table I compares the theoretical fractions and the separations obtained.

These results indicate that certain ingredients or combinations of ingredients can sometimes give erratic results. For example, fraction 2 normally contains only corn sugar, but sometimes other ingredients partially settle there, fraction 3 usually showing a loss. As all ingredients had been tested and found to conform to results in Table I, the erratic results are possibly due to mechanical errors during decantation.

It was also found that occasionally ingredients do not behave in the expected manner. Some known formulas were made up using ingredients (dried whey and dried skimmilk) which had been observed to settle wholly or partially in an unexpected fraction. These results are tabulated below.

1. Formula using dried whey which partially settles in fraction 2, instead of wholly in fraction 3.

Ingredient	*Fraction No.*	*Calculated*	*Found*
Minerals	1	3.0	3.3
Corn sugar	2	25.0	36.5
Wheat flour Dried whey	3	15.0 30.0 } 45.0	29.8
Soybean flour Dried skimmilk	4	27.0 0.0 } 27.0	27.4
Dried skimmilk	5	0.0	

2. Formula using dried skimmilk which settles mostly in fraction 3, instead of fractions 4 and 5.

Ingredient	*Fraction No.*	*Calculated*	*Found*
Minerals	1	3.0	3.1
Corn sugar	2	0.0	5.0
Wheat flour Oat flour Dried whey	3	10.0 10.0 20.0 } 40.0	75.8
Soybean flour Dried skimmilk	4	17.0 } 47.0	11.6
Dried skimmilk	5	40.0	0.0

From this work it must be realized that separation is not perfect, and microscopic examination of the fractions is necessary. More work is needed to determine the extent of variation in ingredients from different sources of supply and variations caused by different combinations of ingredients. In spite of this, it may be concluded that normally a specific gravity flotation will give a semiquantitative picture of the make-up of a milk replacer, and at the very least, afford easier identification of the ingredients present.

. . . People (cont.)

Alexander N. McFarlane, vp and general sales manager of Corn Products Refining Co., elected president of Corn Products Sales Co.

William D. McFarlane, Toronto, Canada, is the new president of The American Society of Brewing Chemists. Other officers: **Eric Kneen,** pres.-elect; **Mortimer W. Brenner,** vice-pres.; **C. Calvin Dyson, Jr.,** treas.; **Robert W. Rummele,** sec.

Martin Magnus promoted to assistant plant technician of Hillside, N.J., plant of Kraft Foods.

William R. Meagher becomes principal agricultural chemist with Battelle Institute, Columbus, Ohio.

Graham C. Mees appointed president and **John C. Hecker** vp and general manager of Distillation Products Industries. Mees has been vp-sales since 1945. Hecker has been assistant director of research and since 1952 vp in charge of production and technical operations.

W. O. S. Meredith attended the European Brewing Congress in Copenhagen, June 2-9. He then toured some of the principal malting and brewing research centers in Europe and the United Kingdom, spending part of his furlough in the United Kingdom. He expects to return to Winnipeg about September 10.

Emil M. Mrak, chairman of department of food technology, University of California, Davis, was selected to receive the Nicholas Appert Medal of the Chicago section, Institute of Food Technologists, May 14 in Pittsburgh. The award is given for outstanding accomplishments in food technology. Mrak is cited for contributions as researcher, author, and teacher.

Erik R. Nielsen promoted to scientific adviser at Armour Research Foundation.

Paul E. Ramstad, technical director of products control, General Mills, Inc., has been appointed editor of CEREAL SCIENCE TODAY by the directors of the AACC. The appointment was made at the association's annual meeting recently held in San Francisco. Dr. Ramstad is a graduate of the University of Minnesota. He was pre-

viously associatied with the General Mills Research Laboratories, Cornell University, and Oscar Mayer & Co. He replaces W. F. Geddes who will give full attention to the AACC's research journal, CEREAL CHEMISTRY.

Edwin J. Ratajak named manager of process improvement and development at Chas. Pfizer & Co. **Gilbert M. Shull** to direct work on fermentation chemistry, mycology, and chromatography. **Ben A. Sobin** to head basic biochemical research.

John W. Ruch promoted from deputy director to director of AEC's feed materials division at Oak Ridge. **Berwyn M. Robinson** named deputy director to succeed him.

Robert M. Schisla joins central research department of Monsanto at Dayton. **Edith B. Pryor** joins inorganic chemicals division as food technologist at Queeny plant, St. Louis. **Ben W. Martin** and **Edward M. Petrie** join sales department of that division.

Rolland W. P. Short becomes research chemist with A. E. Staley Mfg. Co. (from DuPont).

Vernon K. Watson joins Food Research Laboratories, Inc., as senior food technologist.

. . . Products

A self-operating ion exchange water demineralizer called "Deeminac" is made by Crystal Research Laboratories, Hartford, Conn., for laboratories requiring moderate quantities of mineral-free water. It consists of a quart-size demineralizing unit, metal holding stand, and quart-size graduate having a tight-fitting cover, the filter outlet extending through the cover. It operates unattended; for highest ionic purity the rate is 2 or 3 quarts per hour. Ion exchange resins in the filter turn from blue to brown to indicate exhaustion; a new filter is then plugged in.

Ask about Deeminac Model SD-326; the company's address is 29 Allyn St., Hartford 4, Conn.

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A new vitamin B-12 preparation now on the market, called Vita-Busch 12 and developed by Anheuser-Busch, Inc., was brought out to fill a need for an inexpensive source of this vitamin. Food processors can use it economically for enriching baby foods and cereals. The process, it is said, may eventually help place B-12 alongside thiamine, niacin, and riboflavin as a readily and economically available part of our daily food supply. Before development of this process, B-12 (found in liver more than 30 years ago but unnamed until 1948) was recovered from by-products of antibiotic production and hence was very costly. Anheuser-Busch combined a raw material that readily yields B-12 and new types of fermentation to produce the new nutritional additive inexpensively.

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A portable, dust-tight lighting fixture for illuminating the interiors of grain storage silos, underwriter-approved for use in areas hazardous from flour, starch, or grain dust, has been introduced by a Syracuse firm. The cast-aluminum fixture is a type ADDR-12 floodlight mounted on a triangular, caster-equipped steel dolly which will span a bin manhole 33 inches in diameter. A hinged door is held in place by three C-clamps. The floodlight contains a medium screw-base receptacle, polished reflector, and heat-resistant lens; it accommodates a 250-watt "G" bulb lamp.

For further information write Crouse-Hinds Co., Wolf and 7th North Sts., Syracuse, N.Y.

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Gibberellic acids, which speed plant growth as much as three times, are being made available in commercial quantities by Abbott Laboratories, North Chicago, Ill. The acids, derived by a fermentation process from the fungus Gibberella fujikuroi, also cause earlier flowering, faster germination, more rapid seed muturation, and release from dormancy. Dilute solutions of only a few parts in a million may be sprayed on the plant or applied as a droplet to the growing tip.

Among plants which respond to the treatment are flowers, ornamentals, vines, and small trees. Some research has been done on the use of gibberellic acids on food plants, but further investigations of residues are necessary before the

acids can be recommended for food, feed, and fiber crops, Abbott said.

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A new medicinal agent, Trithiadol, developed by the Sterling-Winthrop Research Institute and to be marketed shortly by Sterwin Chemicals, Inc., has been found effective in preventing coccidiosis in broiler chickens. The new compound has been tested extensively in the laboratory and on chicken farms and is expected to have substantial economic importance for the poultry industry. Growers were able to raise broilers to a marketable weight at less cost for feed, and no flavor or odor was imparted to the flesh of chickens after feeding. Trithiadol did not affect egg production, eggshell color, or texture, or interior quality of eggs. According to the announcement, it is compatible with other feed additives such as vitamins, Aureomycin, penicillin, 3-nitro 4-hydroxyphenylarsonic acid, and arsanilic acid; noncaking in containers; stable when mixed in feed and stored for long periods.

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Air flow for fume exhaust can now be changed by remote control during the operation of the fume hood and with safety sash open or closed. The "Safe 'n Easy" Remote Control is operated by a handle located on the outside control panel, which the chemist turns, right or left, to adjust the baffle top and bottom inside the fume hood for any desired air flow apertures. Thus the operator is not required to stop the test, remove all apparatus, crawl inside the hood, reach into the rear to adjust baffles manually, and then replace the apparatus. One simple motion outside the fume hood regulates the air flow. An optional feature available with fume hoods. For descriptive literature write: Laboratory Furniture Co., Inc., Old Country Road, Mineola, N. Y.

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Amlab Products, a new line of steel laboratory furniture, will be produced and marketed by Youngstown Kitchens Division of American-Standard. Planning and installation assistance will be given and the policy will be toward designing and manufacturing to customers' individual requirements. Research in fume hood design is now in progress.

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Apparatus designed especially for gas chromatography or other instrumental gas analysis has been developed by Gow-Mac Instrument Co.: thermal conductivity cells and accessories in brass or stainless steel; special power supply and bridge control; detectors for gas chromatography; and the Gas Master for evaluating the thermal conductivity method and developing sampling systems. The fumigant Gas Master for methyl bromide and carbon tetrachloride compounds measures continuously mixtures of methyl bromide and air as used for control of such pests as the Khapra beetle and termites. Distribution and penetration of the fumigant in grain elevator, freight car, or warehouse are indicated continuously. (Gow - Mac Instrument Co., 100 Kings Road, Madison, N.J.)

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Just off the press and available on request is S & S Bulletin No. 80, a summary of applications of S & S filter papers to chromatography and electrophoresis. Address Chicago Apparatus Co., 1735 North Ashland Ave., Chicago 22, Ill.

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A new series of variable-speed disk feeders, designed especially for exact proportioning or batching of crushed or ground dry material such as chemicals and additives, is announced. Rate of discharge is accurately controlled and can be varied during operation with a hand-wheel adjustment. The smallest of several sizes has a constant feed range from a light trickle up to 2000 lb. per hour; larger models can feed up to 80 tons per hour. Agitation pins on the disks keep the material being handled in a loose condition. Where intense bin agitation is desired so as to prevent packing or "bridging" of the material, models equipped with paddles are available.

For a descriptive bulletin of "Meco SRV" feeders, write Manufacturers Equipment Co., 218 Madeira Ave., Dayton, Ohio.

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Concentrated milk proteins for nutritional supplementation of cereals, flour, and pharmaceutical, infant food, and geriatric diet preparations are available in a series of Sheftene products: edible casein flour (soluble form), edible casein, calcium caseinate, and Sheftene 60. All four are said to be high in protein content (up to 90%), and to provide all eight essential amino acids in proper balance. According to the company's technologists, an abundance of lysine in these milk proteins makes them valuable as multiple amino acid food supplements, particularly in cereal grain products. The company's research division gives them a "biological" value of about 85%.

A brochure, available on request, gives in condensed form results of new nutritional studies and a general description of the Sheftene products and their applications. (Sheffield Chemical, Norwich, N.Y. —a division of National Dairy Products Corp.)

. . . Patter

Delegates numbering 310 at the ASBC annual meeting in New York, May 5-9, represented U.S. and Canadian breweries and related industries including container manufacturers and malt, hops, and cereals industries.

Among new analytical methods discussed was one suggesting an interesting separation of glucose polymers (dextrins) from pentose polymers (pentosan gums) by means of paper-electrophoresis. Another was a new rapid quantitative determination of fats and oils in cereal adjuncts, utilizing the simplicity of column extraction to permit shortening the extraction time by over 50%. In another, a simple arrangement was described in which an amino-acid spot on a paper chromatogram is supported above refluxing ethanol, the color being continuously extracted with fresh solvent. This permits easy spectrophotometric measurement of the extraction of ninhydrin-developed spots reacting with amino acids on paper chromatograms. Also discussed were the effect of kilned sulfur dioxide on malt proteolytic activity during mashing, and the effect of yeast strain on bacterial growth in brewery fermentations.

Detroit was chosen for the 1958 convention.

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For meritorious public-relations performance with its recipes-on-records service to blind homemakers, General Mills has received the Silver Anvil trophy of the American Public Relations Association. This award, presented in Philadelphia April 26 to Miss Janette Kelley, Director of Home Service Department, commends the company for making package mix baking directions available to the blind on 33⅓ rpm plastic records.

Since less than 20 per cent of the blind read Braille, General Mills turned to the Minneapolis Society for the Blind, the Minnesota State

Services for the Blind, the American Foundation for the Blind, and the Library of Congress for guidance in preparing the records to help blind women resume active and useful lives.

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The International Federation of Agricultural Producers held its general conference at Purdue University, May 20-30, meeting for the first time on U.S. soil. Previous meetings in North America have been held in Canada (1949) and Mexico (1951). In celebration of the Federation's tenth anniversary, entertainment and addresses by officials of the U.S. and other countries on May 19 marked the occasion. In a four-day pre-conference tour, delegates were shown the processing, warehousing, and marketing end of agriculture in the Chicago area, and a two-day post-conference tour covered Indiana's agricultural cooperative set-up.

The Federation issues a bulletin, "IFAP News," containing brief reports on crops, markets, etc., in various parts of the world. Its Washington, D.C. office is at 712 Jackson Place, Washington 6.

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Around 2500 scientists and government representatives of almost all countries throughout the world are expected to attend the Fourth International Plant Protection Congress in Hamburg, Germany, September 8 to 15. The program lists the following subjects to be discussed: fundamental research — plant diseases, causal agents, pests; control of diseases and pests; protection of stored products; technique of and equipment for crop protection; plant quarantine; organization of crop protection and legal regulations. An exhibition of worldwide professional literature will be handled by the publishing firm, Paul Parey of Berlin and Hamburg.

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The program for the Cereal Chemistry Convention of the Association of Cereal Research, June 4 to 6 in Detmold, Germany, listed the following speakers and their subjects:

Grain and flour: Th. Biechy (Weihenstephan) — Quality and quantity of gluten in wheat; B. Belderok (Wageningen) — A viscosimetric method for determining the content of alpha-amylase in the grain kernel; G. Brucker (Berlin) — Heat damage during grain drying; Dr. Janicki (Posen) — Vital coloring of aleurone cells of grain with neutral red; P. F. Pelshenke (Detmold) — Evaluation of flours with baking tests; E. Maes (Brussels) — Determining water absorption of flour with a penetrometer; M. Rohrlich (Berlin) — Glutamic acid-decarboxylase in grain; H. Thaler (Munich) — Proteases of flour; G. Hampel (Detmold) — Kernel hardness; Anita Menger (Detmold) — Stability of vitamin E in milling products and bread.

Baking: J. Lemmerzahl (Ulm) — Fermentation tolerance, fermentation optimum, fermentation loss, and oven-spring; B. Thomas (Potsdam - Rehbrucke) — Relations between baking technique and nutrition value; P. Kuukankorpi (Helsinki) — Continuous production of sour "knackebrot"; A. Rotsch and H. Dorner (Detmold) — Aroma of bread.

Microbiological problems: Dr. Bortels (Berlin)—Hypothetical "Wetterstrahlung" as a supposed agent of cosmo-meteorobiological reactions; G. Spicher (Detmold)—Composition of the microflora of grain.

Feedstuffs: Dr. Bruggemann (Munich) — Amino acids in cattle feeding, with special regard to the use of grain and milling products; Dr. Huss (Stuttgart) — New methods in the microscopical feed test.

Human Nutrition

(Continued from page 145)

act as a carrier of the fat-soluble vitamins.

Open Doors for Cereals

Any substantial reduction in fat consumption will, of course, be compensated for by a corresponding increase in consumption of other foods and there is no reason why cereal foods should not account for a good part of this increase. Here may be a real opportunity for the grain industry to expand and in so doing to benefit not only itself but the public as well. Grain products have a clean bill of health in the fat controversy because they are low in fat content, and the fat they do contain is of the type that appears beneficial and supplies nutritionally essential fatty acids.

If corn oil should indeed prove to be unique in its ability to control blood cholesterol levels favorably, a greatly increased demand for it could be anticipated unless the active ingredient could be isolated and readily supplied from other sources. Corn yielding two or three times as much oil as the common commercial varieties has been developed through breeding and could be produced in quantity if the demand should arise.

The baking industry should pay close attention to current research on fat metabolism, since large quantities of fats are used in many bakery products. If present theories are confirmed, demand for either low-fat bakery products or products containing relatively unsaturated fats can be anticipated. Shortening manufacturers may be called upon to supply shortening containing substantial quantities of unsaturated glycerides or perhaps some other substance such as the hypothetical active ingredient of corn oil that may be found to have a favorable influence on fat metabolism.

We are living in a rapidly changing world, but with all these changes food remains and will continue to remain the prime basic necessity of all mankind. We as cereal chemists represent the most important food industry in the world, since cereal products constitute the world's principal source of food. We shall be called upon more and more to conduct research and provide scientific advice and service that will benefit the producer, the processor, and the consumer of our products. Science is gradually pulling away the veil that shrouds many of the remaining mysteries of life. We can look forward with confidence to better and longer lives, made possible in no small part by a fuller understanding of human nutrition. Let us keep our eyes wide open and our ears to the ground so that we may contribute our share to the better world ahead.

A.A.C.C.

LOCAL SECTIONS

At their regular monthly dinner meeting on April 8 at the Erie County Institute, Buffalo, Niagara Frontier Section members heard Mr. Melvin Firman speak on "Antibiotics and food products." Mr. Firman is director of technical services of the food industries division of American Cyanamid Co.

New officers elected for 1957: Ann Collins, pres.; C. J. Schneider, vice-pres.; R. Van Burek, treas.; Jack W. Monier, sec.

The May meeting, on the 13th, was Ladies' Night. After dinner Charles Ritz of International Milling Co. emceed a movie taken on his trip to Russia last fall, showing Russian life and products — before censorship closed in to prevent such reports. Further entertainment was a trip through the plant of the National Biscuit Co. to see mass-production methods.

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Cincinnati Section's meeting on April 27 at Kroger Food Foundation had both forenoon and afternoon sessions, with lunch at the Kroger Cafeteria. The morning session was a Viscosity Clinic; it was well attended and there was active discussion of possible causes for variation in results. The method of shaking the flour suspension was thought to be the most critical and variable factor affecting the results. The use of a certified wire was recommended. A questionnaire on viscosity methods was filled out in advance by those who took part.

In the afternoon a discussion of various determinations in *Cereal Laboratory Methods*, 6th Edition, was led by several members in turn: C. Steele, moisture-ash; J. Hedding, protein; W. Hanson, viscosity; L. Brenneis, soft wheat baking; and H. Simmons, pH – maltose and pressuremeter.

Ten new members were welcomed into the Section.

New officers elected for 1957-58: James S. Kelly, chairman; Clyde V. Steele, vice-chairman; Leland S. Thomson, sec.-treas.

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Nebraska Section met on April 27th jointly with the Nebraska Bakery Production Club at Castle Hotel, Omaha, with morning and afternoon sessions and luncheon. After the 10:00 a.m. business meeting and election of officers, C. B. Gustafson of Wallace-Tiernan spoke on "pH and its relationship to flour."

In the afternoon a Bakery Sanitation Panel was moderated by Harold McDonald, Bowman Dairy Co. Panel members were Louis Booth (Omar, Inc.); Ralph Timperly (P. F. Petersen Baking Co.); John Slaven (Continental Baking Co.); and Frank Yzkowski, Interstate Baking Co.

Officers for 1957-58 are: Paul J. Mattern, chairman; Howard Becker, vice-chairman; and Rex N. Rucksdashel, sec.-treas.

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For their May meeting, the Midwest Section toured the Argonne National Laboratories, starting from the Chemistry Building at 2:00 p.m. Cocktails and dinner were enjoyed afterward, at the Cypress Inn, Hinsdale, Ill.

Section officers elected for the coming year at the Ap[ril] meeting: Charles S. McWilliams, chairman; Robert Koch, vice-chairman; and Edward I. Feigon, sec.-tre[as.]

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Meeting on April 12 and 13 in Wichita, Pioneer Section elected Lyle P. Carmony, chairman; Claude Neill, vice-chairman; and Wayne V. Parker, secretary-treasurer. Crop Reporting Committee plans for the coming harvest season were discussed by Ralph Potts.

John A. Johnson of Kansas State College spoke on the subject, "Know the functions of ingredients in baking," citing the advantages of knowing what effect each ingredient has on dough structure. James M. Doty of Doty Laboratories gave an enlightening picture of a troubleshooter in a bakery with his talk entitled "What to look for to correct bread quality." Sam D. Fine, Chief of Kansas City District, Food & Drug Administration, spoke on "How the Food and Drug Administration looks at flour." The grain trade has made progress in reducing infestation, he said, and the percentage of cars condemned because of an excess of rodent or insect contamination now is very small.

Lifetime membership in Pioneer Section was presented to C. R. Harlow, Enid, Oklahoma. Pioneer Check Sample Awards went to several members for outstanding analytical work: moisture and protein, H. H. Johnson; ash, John Shellenberger; maltose, Eldon Smurr. These trophies were provided by Wallace & Tiernan, Sterwin Chemicals, Research Products Company, and Kansas Milling Co.

Next meeting will be in August at Hotel Youngblood, Enid, Oklahoma.

the President's Corner

news of the association

The Northern California Section is to be congratulated on the 42nd Annual Meeting of the Association. The Local Arrangements Committee under the leadership of Ludvig Reimers fully utilized the fine facilities offered by San Francisco to provide for the comfort and entertainment of the A.A.C.C. members and guests. Papers provided by the Program Committee under the leadership of Dale Mecham were outstanding and, I hope, served to justify your expense accounts.

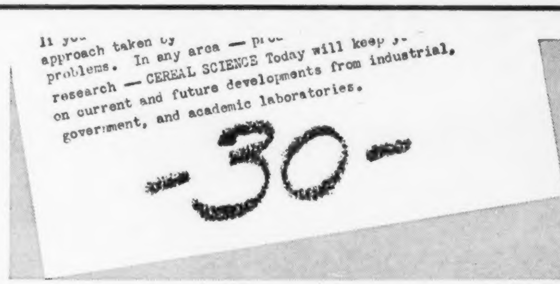
Attendance did not match that of the 41st Annual Meeting in New York. This decrease in attendance was partly due to the great travel distance required by the majority of A.A.C.C. members. It was also due to the fact that the Institute of Food Technologists had held its annual meeting the previous week in Pittsburgh which siphoned off some of the Association's members who regularly attend our Annual Meeting.

This conflict was caused when the Institute of Food Technologists changed its meeting date from June to May without consulting with the A.A.C.C. We have just completed arrangements to avoid an even more serious conflict next year. The new dates for our 1958 meeting in Cincinnati will be April 7 to 11. We hope this change will enable our members to attend both meetings if they desire. There are no conflicts in 1959 or in 1960.

The conclusion of the 42nd Annual Meeting marked the start of another fiscal year of the Association. Under the leadership of the Technical Policy Committee headed by John A. Johnson, the technical committees of the Association will continue their efforts which benefit not only the Association but the cereal industry as a whole. Members desiring to participate on a technical committee should contact John A. Johnson, Kansas State College, Manhattan, Kansas.

Dr. Geddes' resignation as editor of CEREAL SCIENCE TODAY has been accepted with regret. Perhaps, some of the readers have failed to notice the masthead of this issue which modestly announces a new editor of CEREAL SCIENCE TODAY. The Board of Directors is grateful for Paul Ramstad's willingness to assume the responsibilities of editorship of CEREAL SCIENCE TODAY and Dr. Geddes' willingness to continue as Editor-in-Chief of *CEREAL CHEMISTRY*. Their continued success will depend not only upon the cooperation and support of our headquarters staff but of the membership of the Association.

W. B. BRADLEY



Observations

Once again the AACC has demonstrated its viability by holding a highly successful meeting far from its normal center of activities. The San Francisco gathering was well attended and the exchange of technical information most rewarding.

Of the many fine papers that were presented I was particularly interested in hearing Karl Brandt of Stanford University discuss, "Dynamic Shifts in the American Cereal Economy." Mr. Brandt emphasized the current shift from human utilization to animal utilization of cereal products and pointed out the vital role the laboratory has played and must play in this conversion.

The country's rapidly growing broiler industry is ample proof of what science can do if given the opportunity and the heart of the whole broiler industry is the feed mills. These mills must be able to offer the latest in complex formula feeds and their laboratories must be able to analyze for vitamins, minerals, antibiotics, and other medications. We would welcome the opportunity of consulting with any mill having special problems in this area. Our long experience and up-to-date facilities enable us to provide highly accurate assays at a low cost.

Field reports are now coming in on the approaching wheat harvest. From all indications the harvest in Oklahoma, Kansas, and Nebraska will occur about the same time. This will mean an unusually large number of samples to be processed at once. If your laboratory becomes temporarily overcrowded we can be of genuine service. Preliminary tests on early samples indicate a lower protein content than last year. We will give further reports as more data become available.

Jim Doty

DOTY Technical Laboratories

1435 Clay St.,
North Kansas City 16, Mo.

MILLING — FEED ANALYSIS — VITAMIN ASSAYS — BAKING — SANITATION

AACC Behind "Iron Curtain"

Members of the Association will be interested in the following letter that was received by Dr. J. Ansel Anderson, co-author of our Monograph II:

Publishing House of
Foreign Literature,
Moscow, USSR

20 March 1957

Highly esteemed Mr. Anderson

We are sending to you and to Mr. Alcock two copies of the Russian translation of the book "Storage of Cereal Grains and Their Products." On this occasion we also communicate that this book was accepted with great interest by the Soviet specialists.

Very truly yours

Boris Shabat
for the Director

Since Russia does not normally respect foreign copyrights, the above letter was the first news of our "success" in that country.

Another Year

Although its only July according to the calendar, the end of the San Francisco meeting really marked the end of the year for the AACC staff. While our regular work of publishing two journals goes on uninterrupted from month to month we do reach our peak work load just before the annual meeting. Thus we tend to think in terms of meeting to meeting instead of from January to January.

The San Francisco meeting was a good one. While we didn't have a record attendance the turnout was high considering it was our first trip to the West Coast. We had an unusually large number of wives attend for which we were quite pleased. The weatherman was fairly kind giving us that California sunshine three out of the four days.

Next year the meeting location will be Cincinnati and the dates April 7 to 11. This is contrary to what you may have heard in San Francisco or from friends who were there. Originally we had our traditional third week in May set aside, but made a last minute change to accommodate many of our members who found themselves in the position of having to be in two places at the same time. With this new date there will be no conflict with the IFT.

There will be one unusual aspect of the Cincinnati meeting. It begins on a Tuesday! In making our change we had but one choice and that was the week of April 6. Since this was Easter Sunday we decided to start the convention on Tuesday with registration opening Monday evening. The meeting will run from Tuesday morning through Friday afternoon. Now that we are aware IFT is meeting in May for the next couple of years conflicts can be avoided so that our members can attend both of these very fine gatherings.

Future Convention Cities

For your information and long range thinking, the AACC will be meeting in Washington, D. C. in 1959; Chicago in 1960; Dallas in 1961. Dates for these meetings will be announced shortly.

For Better Living

• A new preservative to protect cakes, pickles, salads and cheeses from spoilage is now being used by many companies in food production. It effectively controls the growth of molds and yeasts and helps maintain natural flavor. It is safe to use because it is chemically similar to edible fats and oils.

• A soil test kit is now available which enables gardeners to mix their own fertilizer to get precisely the formulation required. Separately packaged compounds of nitrogen, phosphorus, and potash are being marketed in 1-lb. plastic bags.

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